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**Nongame Mammal Inventory of the
Utah Oil Shale Area**

by

Michael L. Perry

(Consulting Biologist, Natural History State Museum)

Prepared for

Utah State Division of Wildlife Resources

and

The U.S. Bureau of Land Management

Salt Lake City, Utah

1975

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TABLE OF CONTENTS

Acknowledgements	ii
List of Figures	IV
List of Tables	V
Abstract	VI
Introduction	1
Contract Agreement	1
Technical Objectives	1
Location of the Study Area	2
Physical Features of the Area	2
Methods and Materials	2
Literature Survey	3
Summary of Field Work	4
Vegetative Associations	5
Habitat Utilization	15
Species Accounts	25
Population Densities and Habitat Preferences	43
Threatened and Endangered Species ;.....	47
Harvest and Trapping of Carnivores and Furbearers	48
Impact and Recommendations	49
Literature Cited	50

List of Tables

1. Summary of collecting localities within the Oil Shale Study Area 7
2. Checklist of Nongame Mammals of the Utah Oil Shale Area 8

List of Figures

1. Census localities of Nongame Mammals of Utah Oil Shale Lands 8
2. Species and Number of Small Nongame Mammals Collected in Zone 2 of the Utah Oil Shale Area 1974 - 1975 17
3. Checklist of Burrows of Mammals Collected by Means, 1973, and Parry, 1974 - 75 17
4. Species and Percentages of Occurrence of Small Mammals Collected in Each Vegetative Type of the Utah Oil Shale Area 1974 - 1975 26

List of Tables

1. Gazetteer of Collecting Localities Within the Oil Shale Study Area	7
2. Checklist of Nongame Mammals of the Utah Oil Shale Area	9
3. Species and Number of Small Nongame Mammals Collected in Zone 2 of the Utah Oil Shale Area 1974 - 1975	11
4. Habitat Utilization of Small Nongame Mammals on Utah Oil Shale Area	16
5. Comparison of Numbers of Mammals Collected by Olsen, 1973, and Perry, 1974 - 75	17
6. Numbers and Percentages of Occurrence of Small Mammals Collected in Each Vegetative Type of the Utah Oil Shale Area 1974 - 1975	44

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16. Abstract During the spring and summer of 1974 and 1975 a field inventory of nongame mammals was conducted on Utah's oil shale lands in northeastern Utah. The area, located south of Bonanza, Utah, is characterized as a dry, semi-arid plateau sloping gently to the north where it meets the Uinta Basin. Mammal studies conducted by previous researchers revealed a diversity of sixty-three different kinds. In 1973 Olsen collected and studied small nongame mammals of the oil shale area and identified abundance and densities. The present study is a continuation of Olsen's small mammal investigation and thus serves as a "monitor" to his study.

Six vegetative types were sampled during the survey: 1) Cottonwood, willow, and tamarix 2) desert shrub 3) salt desert 4) greasewood 5) sagebrush and 6) pinyon-juniper. The ecological preference, relative abundance, and density were determined for each of the species.

Specimens were collected with snap traps set at 30 foot intervals for two to three consecutive nights at each site. Twenty-five localities were sampled in the study area. Eighteen kinds of small mammals were found to occur in the area. The most common species were in order of their abundance, Deer Mouse (Peromyscus maniculatus), Colorado Chipmunk (Eutamias quadrivittatus), Apache Pocket Mouse (Perognathus apache), Ord's Kangaroo Rat (Dipodomys ordii), Desert Woodrat (Neotoma lepida), and the Pinyon Mouse (Peromyscus truei).

17a. Descriptors

*Nongame mammals, abundance, densities, vegetative types, snap traps, small mammals, predators.

17b. Identifiers

*Oil shale area, Uintah County, Uinta Basin, White River, Evacuation Creek, *Utah

17c. COWRR Field & Group 06G, 05C

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Abstractor Michael L. Perry

Institution Natural History State Museum

Introduction

Contract Agreement - An agreement between the Utah State Division of Wildlife Resources and the Contractors, Drs. William H. Behle, Arden R. Gaufin, and Michael L. Perry was entered into on July 1, 1974 for studies of Wildlife on the Utah Oil Shale Area. This study was made for the U.S. Bureau of Land Management. The contractor Michael L. Perry, is thus responsible for the studies of nongame mammals which is covered in this report. The provisions of the contract originally required a draft final report on April 15, 1975 and the final report 45 days after receiving the Division's comments. An amendment to this granted extension to September 15, 1975 for the draft final report and the final report no later than November 30, 1975.

A progress report was submitted on January 1, 1975 summarizing field work and forecasting studies to be completed the following spring and summer.

This report constitutes the total information obtained during the study.

Technical Objectives - The purposes of the nongame mammal study were:

1) to establish relative numbers and abundance of each nongame mammal species (common, uncommon, or rare occurrence) by habitat preference or area.

(This was to be a continuation of Dr. P.F. Olsen's 1973 small mammal study.)

2) to gather hunting and trapping harvest data on carnivores and furbearers.

From the information obtained through field studies and examination of data in the literature, the existing faunistic situation could be assessed and trends and recommendations regarding management could be identified.

Location of the Study Area - The general description of Utah's Oil Shale development lands, as given in attachment A of the contract, is "the White River Basin and Green River within the area containing oil shale yields of 25 gallons per ton". Within that area two zones of importance occur. Zone 1 is the area designated for the aquatic studies and includes the White River and its perennial tributaries. Zone 2, or the land designated for the terrestrial wildlife studies, is the area within the boundaries of: the White River from the Utah-Colorado border west to Bitter Creek; south along Bitter Creek to the junction of township 12 and 13, then east to the Utah Colorado border, and north along the state border to the White River.

Physical Features of the Area - The oil shale region may be characterized as a barren, semi-arid country dissected by precipitous canyons along the White River and its drainages. Throughout the region are numerous buttes and mesas. Along the floodplains of the White River are riparian woodlands which support the greatest variety and number of mammals. South of the White River the East Tavaputs Plateau rises gently to an elevation of 8,000 feet and breaks off sharply to a region of east-west cliffs known as the Book Cliffs. North of the White River the Uinta Basin constitutes the drainage of Green River.

Methods and Materials

The initial emphasis was to survey the literature and extract material pertaining to the area. Several preliminary trips were made (in conjunc-

tion with the initial raptor survey work) to investigate road conditions and accessibility to collecting sites. As specified in the contract the small mammal portion of the study was to be a continuation of the study conducted by Dr. Pete Olsen in 1973. It was therefore suggested by the DWR to follow the exact methods and procedures in censusing as those used by Olsen. In essence the study became a "monitor" to Olsen's work. The collecting sites were then identified (Olsen 1973) and censused in the following manner: "A line of 50 Museum Special or Victor -4- Way mouse-size snap traps with single traps were set at 30 foot intervals and baited with a mixture of peanut butter and oatmeal" (Olsen 1973:21) and set at each of the 25 different sites in the study area, and run for two to three consecutive nights. Additional collections were made with large rat traps and live traps in different areas to run a comparison. Additional specimens were also collected with a 4.10 shotgun or recorded by sight observation when possible. David Prouse, a University of Utah graduate in Biology, assisted in the collection of the data and spent 36 man days during August and September 1974, in the field.

During June and the first part of July 1975 additional censusing was conducted along the riparian woodlands of the White River. These areas were not collected previously by Olsen but it was felt the data would compliment and constitute a more complete picture of the area.

Harvest information on hunting and trapping of nongame mammals was obtained and included within this report.

Literature Survey

A thorough search of the literature and prior studies was made by Olsen

tion with the initial rapid survey work to investigate road conditions and accessibility to collecting sites. As specified in the contract the small mammal portion of the study was to be a continuation of the study conducted by Dr. Peter Olson in 1973. It was therefore suggested by the DNR to follow the same methods and procedures in conducting as those used by Olson. In essence the study became a "monitor" of Olson's work.

The collecting sites were then identified (Olson 1973) and censused in the following manner: "A line of 30 Mammal Traps or Victor 4-Way mouse-trap traps with single traps were set at 30 foot intervals and baited with a mixture of peanut butter and oatmeal." (Olson 1973:21) and set at each of the 25 different sites in the study area, and run for two to three consecutive nights. Additional collections were made with large rat traps and live traps in different areas to run a comparison. Additional species were also collected with a 4.10 shaggy or reported by night count-

action when possible. David Frounse, a University of Utah graduate in Biology, assisted in the collection of the data and spent 36 man days during August and September 1974, in the field.

During June and the first part of July 1975 additional censusing was conducted along the riparian woodlands of the White River. These areas were not collected previously by Olson but it was felt the data would complement and consolidate a more complete picture of the area.

Harvest information on hunting and trapping of nongame mammals was obtained and included within this report.

Literature Survey

A thorough search of the literature and prior studies was made by Olson

and included in his report on Wildlife Resources of Utah Oil Shale Lands (1973: 20,21). By way of summary the findings were that in the 1930's some 500 specimens were collected by the Carnegie Museum. In 1952 Durrant published "Mammals of Utah" in which 200 specimens were examined from the oil shale area. Kelson (1951) collected 145 specimens from the area and Hansen (1954) obtained six ground squirrels from the Willow Creek area. Of primary importance was the study Ranck (1961) made of the East Tavaputs Plateau and from which Olsen based much of his work from of the oil shale area. Olsen (1973) updated Ranck's work and collected during August and September 1973 from each of the representative habitats in the oil shale area. He obtained 717 records of 20 species. Inasmuch as that report contained records and data of all mammals in the region, this report is restricted solely to the nongame species.

Summary of Field Work

To maintain consistency with the methodology initiated by Olsen field work commenced in late August through September 1974 or a total of 36 man days. Prior to this time field observations were conducted by flush techniques. The following spring 14 man days were spent in late June and July collecting along the White River and Repeated stops at those censused the previous year.

and included in the report on the collection of Utah Oil Shale Insects
(1918, 20, 21). By way of summary the following data from the 1918
and 1922 specimens were collected by the Carnegie Museum. In 1922 further
published "Insects of Utah" in which 200 specimens were examined from the
oil shale areas. Eakin (1921) collected 145 specimens from the same and
Hansen (1924) obtained six ground specimens from the Willow Creek area.
Of primary importance was the study Eakin (1921) made of the basic taxonomy
of the insects from which Olsen based much of his work from the oil shale
area. Olsen (1917) repeated Eakin's work and collected during August and
September, 1917 from each of the representative habitats in the oil shale
area. He obtained 717 insects of 10 species. Insects, as they report in
examined records and data of all insects in the region, this report is
restricted only to the insects species.

Summary of Field Work

To maintain consistency with the methodology followed by Olsen field
work continued in late August through September 1918 for a total of 26 days.
Prior to this time field observations were conducted by Olsen each
day. The following spring 1919 was spent in late June and July
collecting along the White River and adjacent slopes at those locations the
previous year.

Vegetative Associations

Six vegetative communities were recognized in the oil shale environmental impact statement (USDI, 1973) and again used by Olsen (1973). To maintain consistency with those reports and the data available for those specific areas the same vegetative classifications will be used.

- 1) Cottonwood, willow, tamarix - This association occurs primarily along the White River, also called riparian woodland, and occurs somewhat sparsely in the major canyon tributaries with intermittent or permanent streams. Intermixed throughout is greasewood, squawbush and salt grass. This area is perhaps the most propitious in terms of numbers of small mammals. The thick understory provides not only protection but an abundant source of food.
- 2) Desert shrub - This occurs extensively north of the White River and to a lesser extent in the southern areas where xeric conditions prevail. Vegetation is sparse and consists of greasewood, shadscale, big sage, four-wing saltbush and rabbitbrush. Other plants are horsebrush, black sage, ricegrass and cheatgrass.
- 3) Salt desert shrub - These plants are associated with drier, more saline soils and are represented by mat saltbush and Nuttall's saltbush. Depending upon edaphic conditions other plants such as shadscale, big sage, winterfat, and horsebrush will be found.
- 4) Greasewood - This is found in most of the drainages and river bottoms that are subject to periodic flooding or high water tables. On the drier benchlands its growth is more stunted and sparse. Plants of lesser

importance are rabbitbrush, big sage, alkali sacaton, and saltgrass.

5) Sagebrush - This is the dominant plant on higher benchlands where more fertile soils exist and occupies the transition zone with the pinyon-juniper. At the lower elevation the transition between the salt desert scrub types is gradual and is represented by black sage, rabbitbrush, and shadscale. In association with this community throughout is snakeweed, bluestem wheatgrass and, Indian ricegrass.

6) Pinyon-Juniper - This area dominates the vegetative types throughout the east Taviputts Plateau from 5000 feet to 7,500 feet in elevation. At the lower elevations it is transitional with sagebrush and forms more open stands frequently extending into projections onto the buttes, mesas, and rocky slopes. In these areas often where poorer soils prevail the trees are frequently more stunted and more sparse.

importance are vegetation, big game, wildlife, and fisheries.

3) Vegetation - This is the dominant plant on higher plateaus where more fertile soils exist and occupies the transition zone with the plains. At the lower elevation the transition between the soil types is gradual and is represented by black sage, Gambusia, and alfalfa. In association with this community throughout is introduced, domesticated and, Indian vegetation.

4) Plains-Transition - This zone dominates the vegetative types throughout the most favorable places from 2000 feet to 1500 feet in elevation. At the lower elevation it is transitional with sagebrush and forams more open stands frequently extending into projections into the buttes, mesas, and rocky slopes. In these areas where pasture lands prevail the trees are frequently more scattered and more sparse.

Table 1 - Gazetteer of Collecting Localities Within the

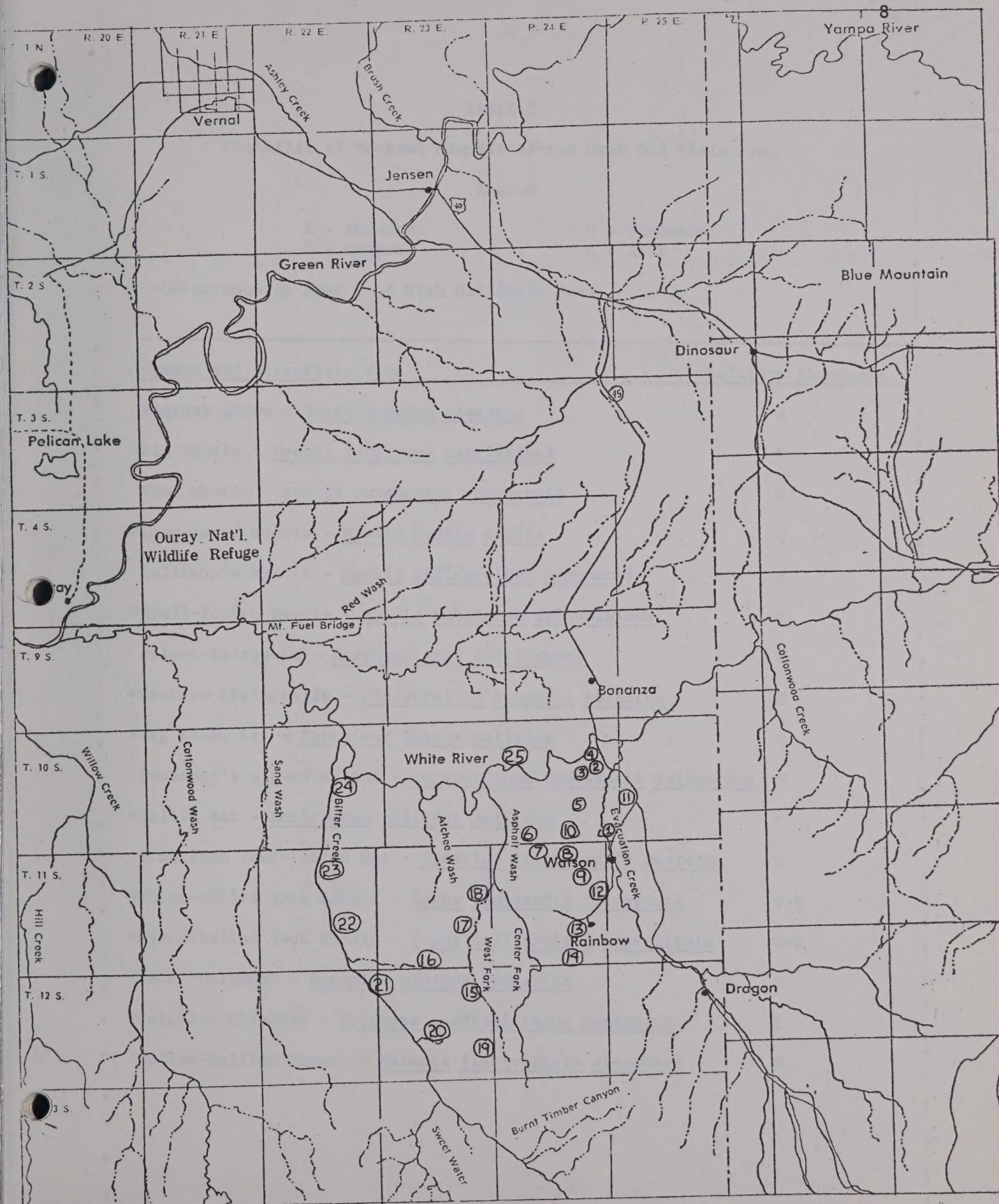
Oil Shale Study Area

Site Number	Vegetative Association	Elevation	Location (Range, Township, Section)
1	S	5750	SW $\frac{1}{4}$ 20, T 10S, R 25E
2	G	5100	NE $\frac{1}{4}$ 13, T 10S, R 24E
3	SDS	5250	NW $\frac{1}{4}$ 13, T 10S, R 24E
4	SDS	5150	NE $\frac{1}{4}$ 12, T 10S, R 24E
5	PJ	5350	NE $\frac{1}{4}$ 23, T 10S, R 24E
6	CWT	5250	SW $\frac{1}{4}$ 21, T 10S, R 24E
7	S	5350	SE $\frac{1}{4}$ 28, T 10S, R 24E
8	S	5550	NW $\frac{1}{4}$ 34, T 10S, R 24E
9	PJ	5550	NW $\frac{1}{4}$ 35, T 10S, R 24E
10	PJ	5450	SE $\frac{1}{4}$ 23, T 10S, R 24E
11	DS	5550	NW $\frac{1}{4}$ 20, T 10S, R 25E
12	S	5550	SW $\frac{1}{4}$ 31, T 10S, R 25E
13	S	5700	NW $\frac{1}{4}$ 18, T 11S, R 25E
14	PJ	6100	SE $\frac{1}{4}$ 23, T 11S, R 24E
15	PJ	6100	SE $\frac{1}{4}$ 31, T 11S, R 24E
16	PJ	5675	NE $\frac{1}{4}$ 23, T 11S, R 23E
17	S	5400	NW $\frac{1}{4}$ 18, T 11S, R 24E
18	G	5500	NW $\frac{1}{4}$ 7, T 11S, R 24E
19	PJ	6275	NW $\frac{1}{4}$ 20, T 12S, R 24E
20	S	6075	SW $\frac{1}{4}$ 2, T 12S, R 23E
21	CWT	5875	SE $\frac{1}{4}$ 32, T 11S, R 23E
22	CWT	5325	SE $\frac{1}{4}$ 23, T 11S, R 22E
23	S	5175	NW $\frac{1}{4}$ 11, T 11S, R 22E
24	G	5050	NW $\frac{1}{4}$ 27, T 10S, R 22E
25	G	5575	SW $\frac{1}{4}$ 21, T 12S, R 23E

Oil Shale Study Area

Site Number	Vegetative Association	Elevation	Location (Range, Township, Section)
1	S	5130	SWF 10, T 10S, R 12E
2	S	5100	SWF 11, T 10S, R 12E
3	SOS	5230	SWF 12, T 10S, R 12E
4	EOS	5130	SWF 13, T 10S, R 12E
5	S1	5230	SWF 14, T 10S, R 12E
6	GWT	5230	SWF 15, T 10S, R 12E
7	S	5230	SWF 16, T 10S, R 12E
8	S	5230	SWF 17, T 10S, R 12E
9	S1	5230	SWF 18, T 10S, R 12E
10	S1	5230	SWF 19, T 10S, R 12E
11	S2	5230	SWF 20, T 10S, R 12E
12	S	5230	SWF 21, T 10S, R 12E
13	S	5200	SWF 22, T 11S, R 12E
14	S1	5100	SWF 23, T 11S, R 12E
15	S1	5100	SWF 24, T 11S, R 12E
16	S1	5075	SWF 25, T 11S, R 12E
17	S	5400	SWF 26, T 11S, R 12E
18	S	5300	SWF 27, T 11S, R 12E
19	S1	5275	SWF 28, T 11S, R 12E
20	S	5075	SWF 29, T 11S, R 12E
21	GWT	5075	SWF 30, T 11S, R 12E
22	GWT	5252	SWF 31, T 11S, R 12E
23	S	5175	SWF 32, T 11S, R 12E
24	S	5050	SWF 33, T 10S, R 12E
25	S	5275	SWF 34, T 11S, R 12E

Figure 1. Census localities of Nongame Mammals of Utah Oil Shale Lands



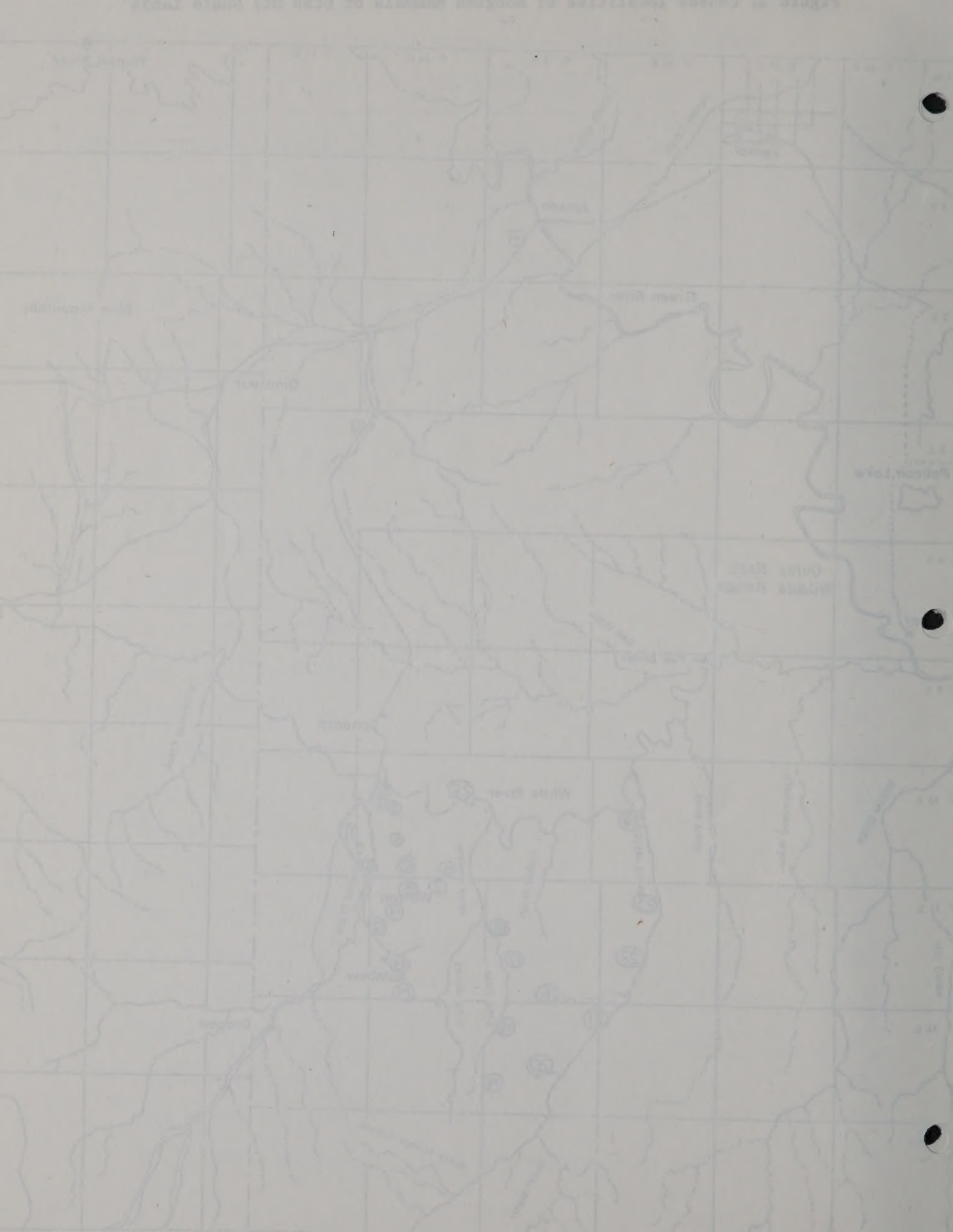


TABLE 2

Checklist of Nongame Mammals of the Utah Oil Shale Area

Legend

A - Abundant

U - Uncommon

C - Common

R - Rare

*Occurrence in Zone 2 of Utah Oil Shale Area

Common and Scientific Name	Relative Abundance
Vagrant Shrew - <u>Sorex vagrans obscurus</u>	R
*Big Myotis - <u>Myotis lucifugus carrissimal</u>	U
Yuma Myotis - <u>Myotis yumanensis yumanensis</u>	U
*Long-eared Myotis - <u>Myotis evotis evotis</u>	U
California Myotis - <u>Myotis californicus stephensi</u>	U
*Small-footed Myotis - <u>Myotis subulatus melanorhimus</u>	U
Silver-haired Bat- <u>Lasionycteris noctivigans</u>	U
*Western Pipistrelle - <u>Pipistrellus hesperus hesperus</u>	C
*Big Brown Bat - <u>Eptesicus fuscus pallidus</u>	C
Townsend's Big-eared Bat - <u>Corynorhinus townsendii Pallescens</u>	U
*Pallid Bat - <u>Anthrozous pallidus pallidus</u>	C
Brazilian Free-tailed Bat - <u>Tadarida brasiliensis mexicana</u>	R
*White-tailed Jack Rabbit - <u>Lepus townsendii townsendii</u>	U-R
*Black-tailed Jack Rabbit - <u>Lepus californicus deserticola</u>	U-R
*Least Chipmunk - <u>Eutamias minimus operarius</u>	C
*Colorado Chipmunk - <u>Eutamias quadrivittatus hopiensis</u>	C
*Yellow-bellied Marmot - <u>Marmota flaviventris nosophora</u>	U

TABLE 2

Checklist of Neogene Mammals of the Utah Oil Shale Area

Legend

W - Unknown
E - RareA - Abundant
C - Common

*Occurrence in Zone 2 of Utah Oil Shale Area

Relative Abundance	Common and Scientific Name
A	<u>Vagant Brown - <i>Sorex vagans</i> sparsus</u>
U	<u>*Big Mole - <i>Hesperomys carolinensis</i></u>
U	<u>Yuma Mole - <i>Hesperomys yumanensis</i></u>
U	<u>*Long-eared Mole - <i>Hesperomys evotis</i></u>
C	<u>California Mole - <i>Hesperomys californicus</i> stephensi</u>
U	<u>*Small-toothed Mole - <i>Hesperomys schultzei</i> wetherbyi</u>
U	<u>Silver-haired Bat - <i>Lasiurus cinereus</i> pallidus</u>
C	<u>*Western Pipit - <i>Ereunetes hesperus</i></u>
C	<u>*Big Brown Bat - <i>Eptesicus fuscus</i> pallidus</u>
U	<u>Tomson's Big-eared Bat - <i>Myotis tomsoni</i> pallidus</u>
C	<u>*Tailless Bat - <i>Antrozous pallidus</i> pallidus</u>
A	<u>Brazilian Tree-toad Bat - <i>Myotis bairdii</i> pallidus</u>
U-A	<u>*Mexican-tailed Jack Rabbit - <i>Lepus texianus</i> tomsoni</u>
U-A	<u>*Black-tailed Jack Rabbit - <i>Lepus californicus</i> deserticola</u>
C	<u>*Least Chipmunk - <i>Eutamias minimus</i> operarius</u>
C	<u>*Colorado Chipmunk - <i>Eutamias quadrivittatus</i> hesperus</u>
U	<u>*Yellow-bellied Sapsucker - <i>Sphyrapicus flaviventris</i> hesperus</u>

TABLE 2

Continued

Common and Scientific Name	Relative Abundance
*White-tailed Antelope Squirrel - <u>Ammospermophilus lecurus</u> <u>pennipes</u>	C
Thirteen-lined Ground Squirrel - <u>Spermophilus tridecemlineatus</u> <u>parvus</u>	U
*Rock Squirrel - <u>Spermophilus variegatus</u> <u>utah</u>	R
*Golden-mantled Ground Squirrel - <u>Spermophilus lateralis</u> <u>lateralis</u>	C
White-tailed Prairie Dog - <u>Cynomys lecurus</u>	U
*Northern Pocket Gopher - <u>Thomomys talpoides</u> <u>ocius</u>	U
*Olive-backed Pocket Mouse - <u>Perognathus fasciatus</u> <u>callistus</u>	U
*Apache Pocket Mouse - <u>Perognathus apache</u> <u>caryi</u>	C
*Ord's Kangaroo Rat - <u>Dipodomys ordii</u> <u>uintensis</u>	C
*Western Harvest Mouse - <u>Reithrodontomys megalotis</u> <u>megalotis</u>	U
*Canyon Mouse - <u>Peromyscus crinitus</u> <u>auripectus</u>	U
*Deer Mouse - <u>Peromyscus maniculatus</u> <u>nebrascensis</u>	A
Brush Mouse - <u>Peromyscus boylii</u> <u>rowleyi</u>	R
*Pinyon Mouse - <u>Peromyscus truei</u> <u>truei</u>	C
*Northern Grasshopper Mouse - <u>Onychomys leucogaster</u> <u>pallascens</u>	U
*Desert Wood Rat - <u>Neotoma lepida</u> <u>sanrafaeli</u>	C
*Bushy-tailed Wood Rat - <u>Neotoma cinerea</u> <u>macrodon</u>	C

TABLE 1

Continued

Relative Abundance	Common and Scientific Name
C	White-tailed Antelope Squirrel - <i>Antilocapra leucurus</i> <i>leucurus</i>
D	Thirteen-lined Ground Squirrel - <i>Spermophilus tridecemlineatus</i> <i>tridecemlineatus</i>
E	Black Squirrel - <i>Sciurus harrisi</i>
C	Golden-crowned Ground Squirrel - <i>Spermophilus lateralis</i> <i>lateralis</i>
D	White-tailed Prairie Dog - <i>Cynomys ludovicianus</i>
D	Northern Pocket Gopher - <i>Thomomys talpoides</i>
D	Olive-backed Pocket Mouse - <i>Perognathus parvulus</i>
C	Apache Pocket Mouse - <i>Perognathus apache</i>
C	Ord's Kangaroo Rat - <i>Dipodomys ordii</i>
D	Western Harvest Mouse - <i>Reithrodontomys major</i>
D	Canyon Mouse - <i>Peromyscus eremicus</i>
A	Desert Mouse - <i>Peromyscus eremicus</i>
E	Great Mouse - <i>Peromyscus boylii</i>
C	Striped Mouse - <i>Peromyscus eremicus</i>
D	Northern Grasshopper Mouse - <i>Onychomys leucogaster</i>
C	Desert Wood Rat - <i>Neotoma lepida</i>
C	Rusty-tailed Wood Rat - <i>Neotoma ruficaudata</i>

TABLE 3

Species and Number of Small Nongame Mammals
Collected in Zone 2 of the
Utah Oil Shale Area
1974 - 1975

Site No.	1	2	3	4	5	6	7	8
Habitat	S	G	SDS	SDS	PJ	CWT	S	S
<u>Species</u>								
<u>Eutamias minimus operarius</u>								
<u>Eutamias quadrivittatus hopiensis</u>				4				
<u>Ammospermophilus leucurus pennipes</u>			1	3				1
<u>Spermophilus variegatus utah</u>								
<u>Spermophilus lateralis lateralis</u>								
<u>Thomomys talpoides ocus</u>						1		
<u>Perognathus fasciatus callistus</u>					1			
<u>Perognathus apache caryi</u>		3	7	3			1	3
<u>Dipodomys ordii uintensis</u>			8		10			
<u>Peromyscus crinitus auripectus</u>		1					1	3
<u>Peromyscus maniculatus nebrascensis</u>	11	7	20	24	32	27	41	30
<u>Peromyscus truei truei</u>				1				
<u>Onychomys leucogaster pallescens</u>								
<u>Neotoma lepida sanrafaeli</u>				4				
<u>Neotoma cinerea macrodon</u>								

TABLE 3
Continued

Site No.	9	10	11	12	13	14	15	16
Habitat	PJ	PJ	DS	S	S	PJ	PJ	PJ
<u>Species</u>								
<u>Eutamias minimus operarius</u>								
<u>Eutamias quadrivittatus hopiensis</u>							13	9
<u>Ammospermophilus leucurus pennipes</u>			1					
<u>Spermophilus variegatus utah</u>								
<u>Spermophilus lateralis lateralis</u>		2						
<u>Thomomys talpoides ocus</u>								
<u>Perognathus fasciatus callistus</u>								
<u>Perognathus apache caryi</u>	2							
<u>Dipodomys ordii uintensis</u>			1					1
<u>Peromyscus crinitus auripectus</u>								
<u>Peromyscus maniculatus nebrascensis</u>	53	21	30	62	38	60	21	21
<u>Peromyscus truei truei</u>		1						2
<u>Onychomys leucogaster pallescens</u>				1				
<u>Neotoma lepida sanrafaeli</u>		1		1				3
<u>Neotoma cinerea macrodon</u>	1							1

TABLE 3

Continued

Site No.	17	18	19	20	21	22	23	24
Habitat	S	G	PJ	S	CWT	CWT	S	G
<u>Species</u>								
<u>Eutamias minimus operarius</u>					1			1
<u>Eutamias quadrivittatus hopiensis</u>	7	3					2	1
<u>Ammospermophilus leucurus pennipes</u>							1	
<u>Spermophilus variegatus utah</u>	1							
<u>Spermophilus lateralis lateralis</u>								
<u>Thomomys talpoides ocius</u>								
<u>Perognathus fasciatus callistus</u>								
<u>Perognathus apache caryi</u>			1	1				
<u>Dipodomys ordii uintensis</u>		1					1	
<u>Peromyscus crinitus auripectus</u>								
<u>Peromyscus maniculatus nebrascensis</u>	33	32	14	25	19	26	17	13
<u>Peromyscus truei truei</u>		2						
<u>Onychomys leucogaster pallescens</u>								
<u>Neotoma lepida sanrafaeli</u>	1		1					
<u>Neotoma cinerea macrodon</u>	1						1	

TABLE 2

Continued

Site No.	17	18	19	20	21	22	23	24
Number	2	2	23	2	CNT	CNT	2	2
Species								
<i>Eutamias minimus oregonus</i>					1			1
<i>Eutamias amoenus hoplandi</i>	1	2					2	1
<i>Amospermophilus leucurus pennipes</i>							1	
<i>Spermophilus variegatus utah</i>	1							
<i>Spermophilus lateralis lateralis</i>								
<i>Thomomys talpoides colus</i>								
<i>Petrogaleus lateralis californicus</i>								
<i>Petrogaleus macrotis calyx</i>			1	1				
<i>Dipodomys ordii microps</i>		1					1	
<i>Petrogaleus crinitus auriferus</i>								
<i>Petrogaleus amabilis nebrascensis</i>	22	22	14	22	19	26	17	12
<i>Petrogaleus truei truei</i>		2						
<i>Onychomys leucogaster pallidus</i>								
<i>Neotoma lepida nevadensis</i>	1	1						
<i>Neotoma cinerea nevadensis</i>	1						1	

TABLE 3

Continued

<u>Site No.</u>	25	<u>TOTAL</u>
<u>Habitat</u>	G	
<u>Species</u>		
<u>Eutamias minimus operarius</u>		2
<u>Eutamias quadrivittatus hopiensis</u>	1	40
<u>Ammospermophilus leucurus pennipes</u>		9
<u>Spermophilus variegatus utah</u>		1
<u>Spermophilus lateralis lateralis</u>	1	2
<u>Thomomys talpoides ocus</u>		1
<u>Perognathus fasciatus callistus</u>		1
<u>Perognathus apache caryi</u>		21
<u>Dipodomys ordii uintensis</u>		22
<u>Peromyscus crinitus auripectus</u>		5
<u>Peromyscus maniculatus nebrascensis</u>	21	698
<u>Peromyscus truei truei</u>	1	7
<u>Onychomys leucogaster pallescens</u>		1
<u>Neotoma lepida sanrafaeli</u>	1	12
<u>Neotoma cinerea macrodon</u>		4
	Total	827

Habitat Utilization

Habitat preference by species was determined on the basis of the number of individuals captured both by Olsen (1973:63) and Perry. A species having a high frequency of occurrence (Table 6, and Olsen 1973:63) is represented with a "+", and lower percentages with an "X", and "-" respectively.

The salt desert shrub supports the largest amount of "high usage" mammals namely, white-tailed antelope squirrel, Apache pocket mouse, Ord's kangaroo rat, and deer mouse, while the pinyon-juniper association contains the largest number of species with "high and moderate" usage combined. The cottonwood-willow-tamarix type supports the lowest number of species although the deer mice occur in large numbers.

Habitat Utilization

Habitat preference by species was determined on the basis of the

number of individuals captured here by Olson (1973:63) and Perry. A
species having a high frequency of occurrence (Table 6, and Olson 1973:63)
is represented with a "4", and lower percentages with an "X", and "0"
respectively.

The salt desert shrub supports the largest amount of "high usage"
communities namely, white-tailed antelope squirrel, Apache pocket mouse, Ord's
kangaroo rat, and deer mouse, while the piñon-juniper association con-
tains the largest number of species with "high and moderate" usage combined.
The cottonwood-willow-tamarix type supports the lowest number of species
although the deer mice occur in large numbers.

TABLE 4

Habitat Utilization of Small Nongame Mammals on Utah Oil Shale Area

Usage: + = High
 X = Moderate
 - = Low

Habitat	Cottonwood Willow-Tamarix	Desert Shrub	Salt Desert Shrub	Greasewood	Sagebrush	Pinyon-Juniper
<u>Species</u>						
<u>Eutamias minimus operarius</u>	X	X	-	X	X	X
<u>Eutamias quadrivittatus hopiensis</u>	-	X	X	X	X	+
<u>Ammospermophilus leucurus pennipes</u>	-	X	+	-	X	X
<u>Spermophilus variegatus utah</u>	-	-	-	-	-	-
<u>Spermophilus lateralis lateralis</u>	-	-	-	X	X	X
<u>Thomomys talpoides ocius</u>	X	-	-	-	-	-
<u>Perognathus fasciatus callistus</u>	-	X	-	-	X	-
<u>Perognathus apache caryi</u>	-	-	+	X	+	X
<u>Dipodomys ordii uintensis</u>	-	X	+	X	+	-
<u>Peromyscus crinitus auripectus</u>	-	X	-	X	X	-
<u>Peromyscus maniculatus nebrascensis</u>	+	+	+	+	+	+
<u>Peromyscus truei truei</u>	-	-	X	X	-	+
<u>Onychomys leucogaster pallescens</u>	-	X	-	-	-	-
<u>Neotoma lepida sanrafaeli</u>	X	-	X	X	X	X
<u>Neotoma cinerea macrodon</u>	-	-	-	-	X	X

TABLE 4

Habitat Utilization of Small Nonpoint Sources on Utah Oil Shale Area

Usage: + = High
 X = Moderate
 - = Low

Habitat	Species	Small Stream	Large Stream	Shrub Area	Open Area	Grassland	Forest
<i>Neotoma cinerea</i>		-	-	-	-	X	X
<i>Neotoma lepida</i>		-	-	X	X	X	X
<i>Oxyechus leucogaster</i>		-	-	-	-	-	-
<i>Peromyscus truei</i>		-	-	X	X	-	-
<i>Peromyscus maniculatus</i>		-	-	+	+	+	+
<i>Peromyscus eremicus</i>		-	-	-	-	X	X
<i>Dipodomys deserti</i>		-	-	+	+	X	-
<i>Perognathus parvus</i>		-	-	+	+	X	-
<i>Perognathus fasciatus</i>		-	-	-	-	X	-
<i>Thomomys talpoides</i>		-	-	-	-	-	X
<i>Spermophilus lateralis</i>		-	-	-	-	X	-
<i>Spermophilus variegatus</i>		-	-	-	-	-	-
<i>Ammodramus leucurus</i>		-	-	+	+	X	-
<i>Eutamias amoenus</i>		-	-	X	X	X	-
<i>Eutamias</i>		-	-	X	X	X	-

TABLE 5

Comparison of Numbers of Mammals

Collected by

Olsen, 1973 and Perry, 1974-75

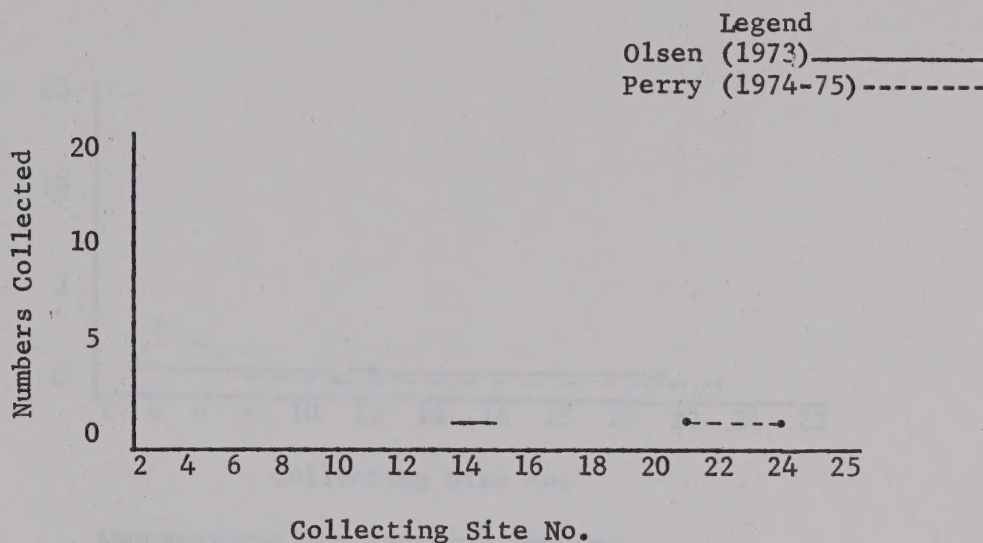
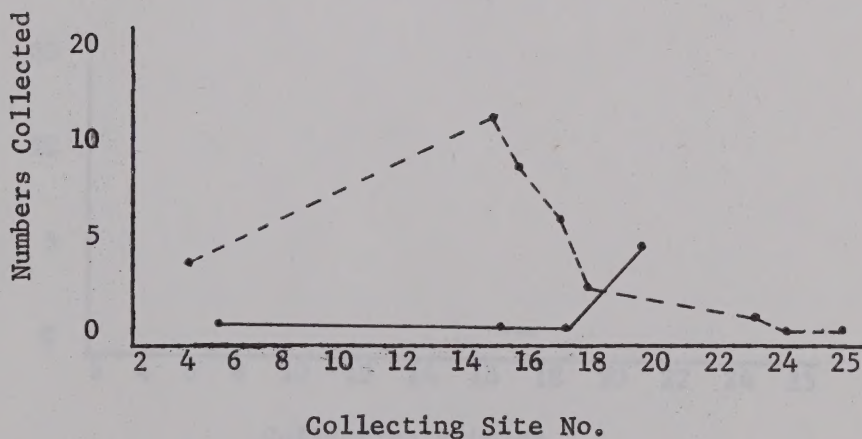
Eutamias minimus operariusEutamias quadrivittatus hopiensus

TABLE 2

Comparison of Numbers of Mammals

Collected by

Olson, 1973 and Perry, 1976-77

Legend
 Olson (1973) ———
 Perry (1976-77) - - - -

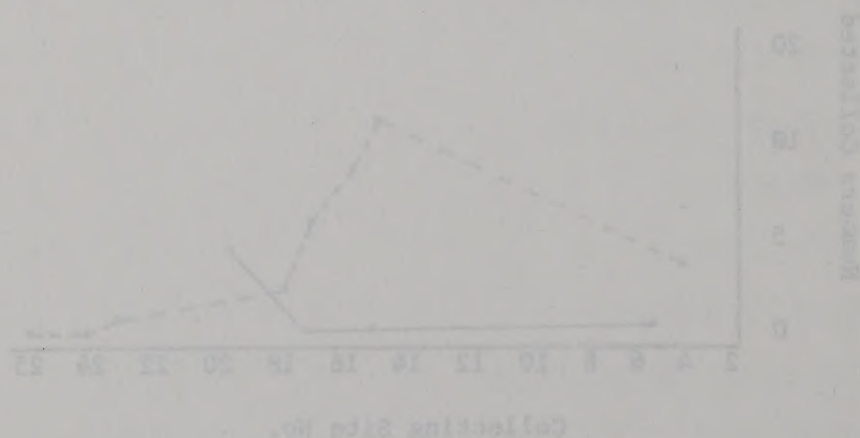
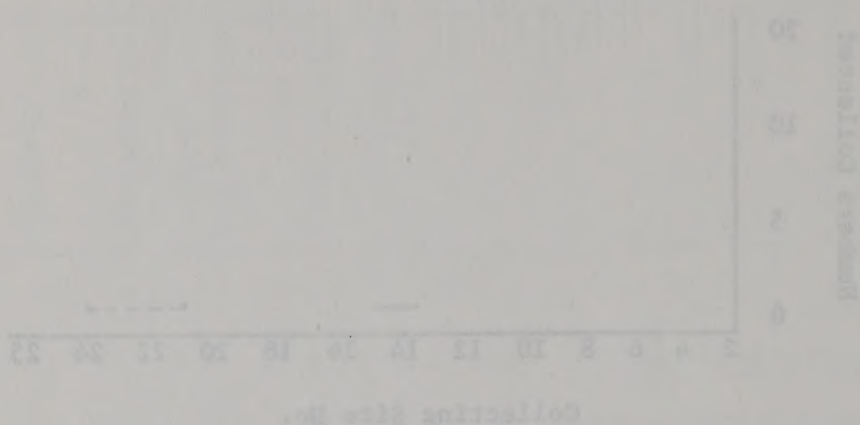
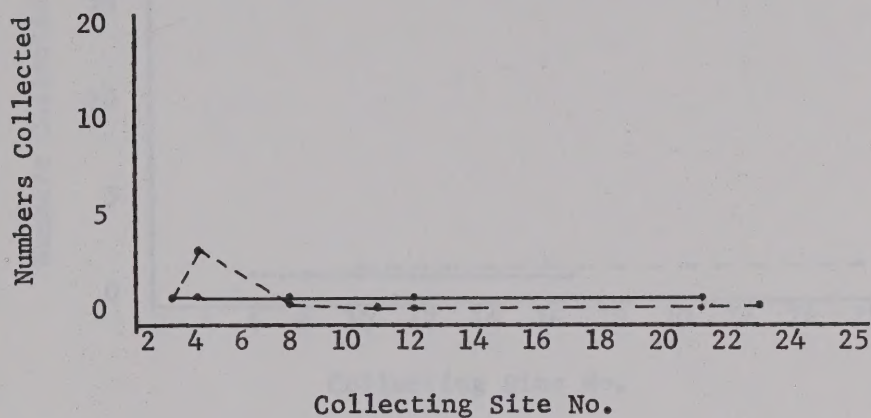
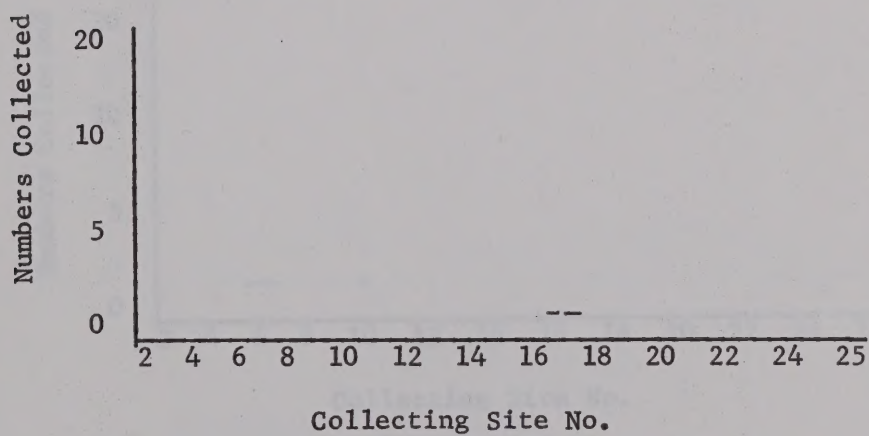
Endemic species of mammals

TABLE 5
Continued



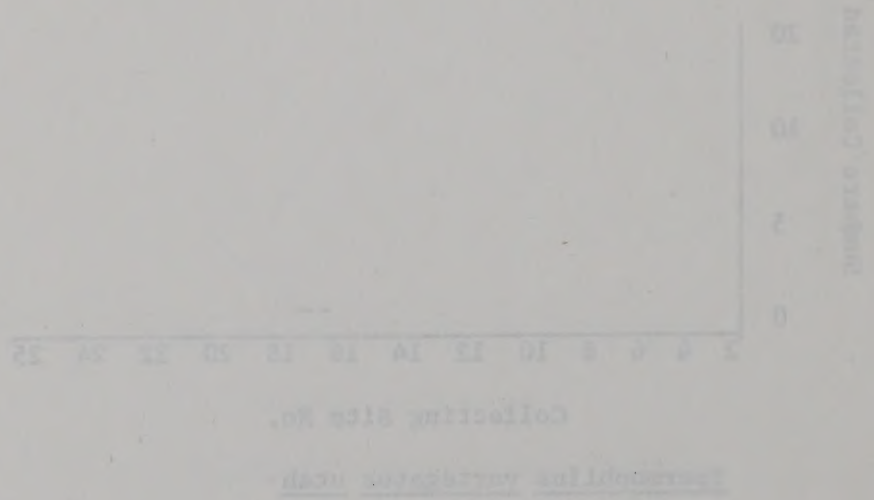
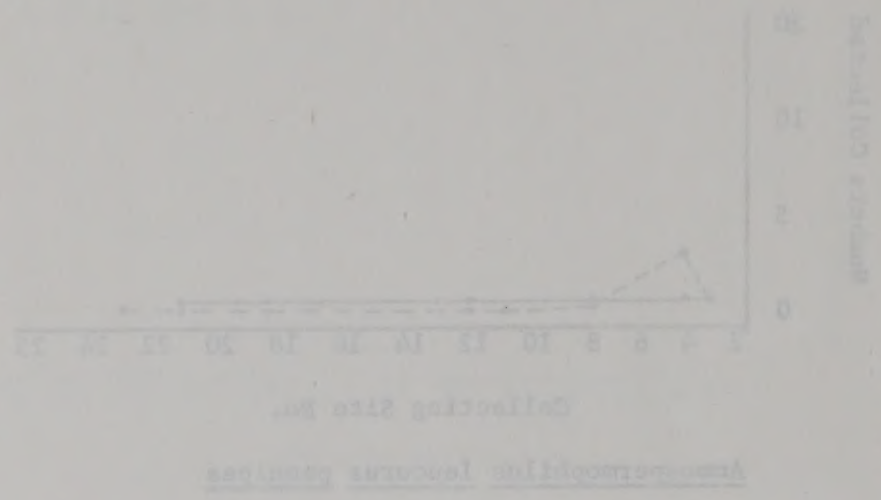
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Sperophilus variegatus utah

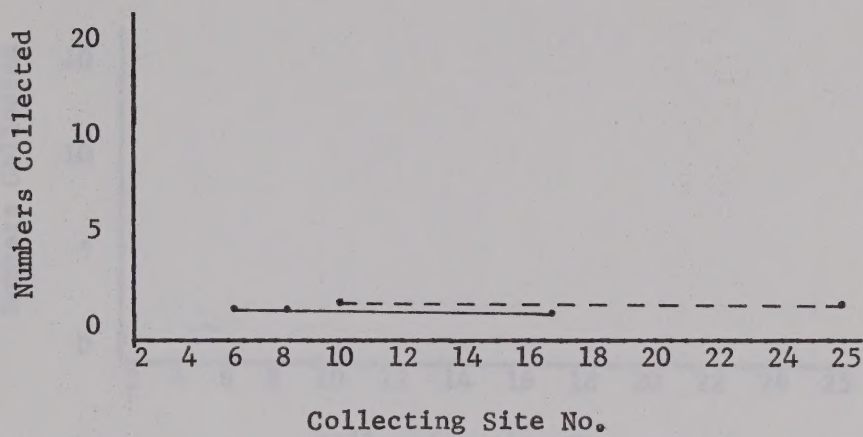
BLM Library
Denver Federal Center
Bldg. 85, OC-521
P.O. Box 25047
Denver, CO 80225

TABLE 2
Continued

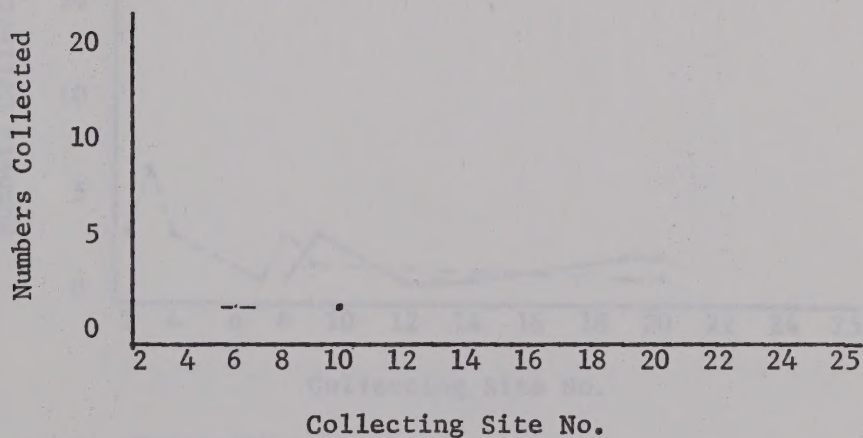


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P.O. Box 25047
Denver, CO 80225

TABLE 5
Continued



Sperophilus lateralis lateralis



Thomomys talpoides ocus

TABLE 3

Continued

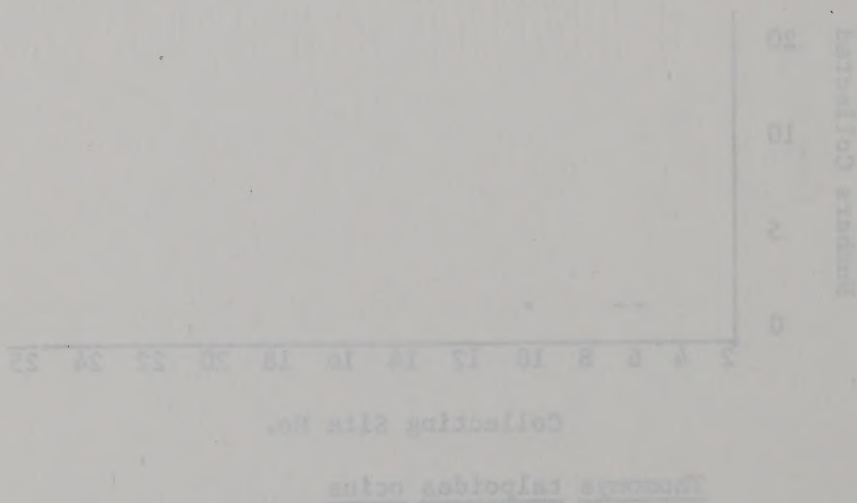
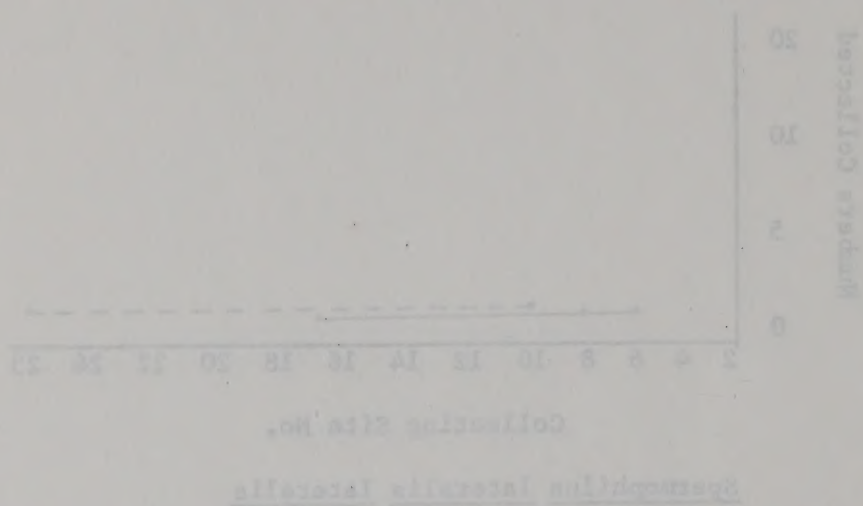


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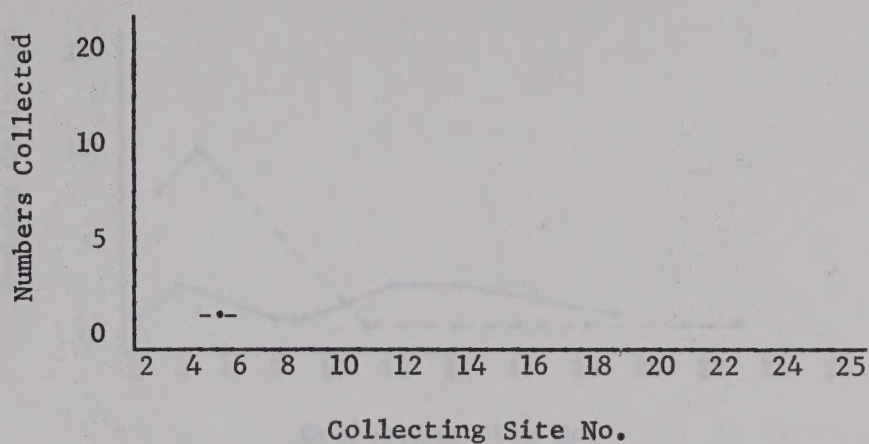
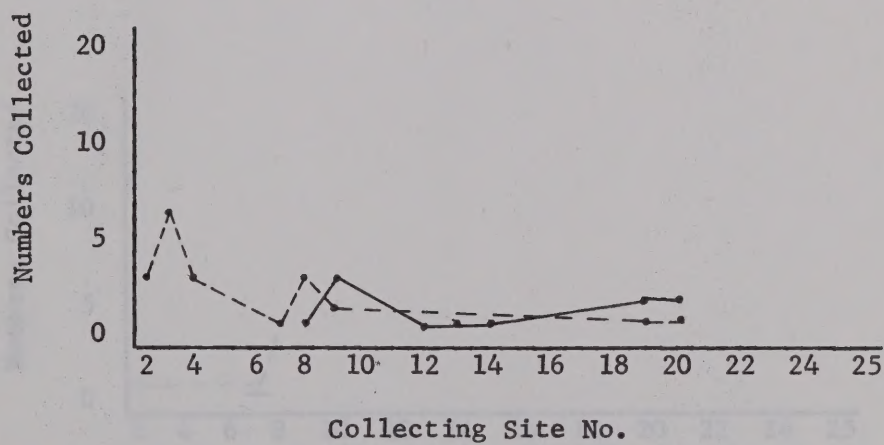
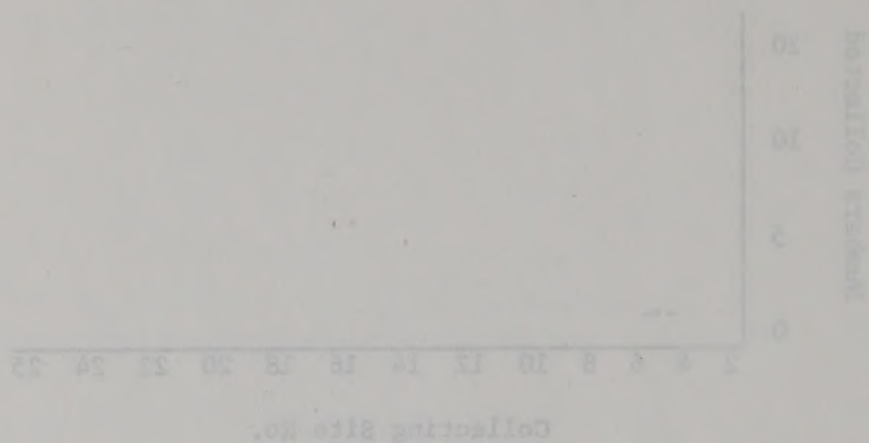
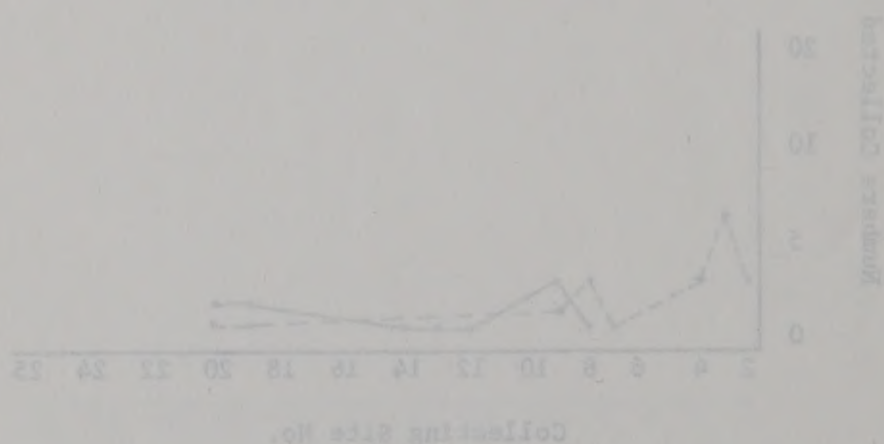
Perognathus fasciatus callistusPerognathus apache caryi

TABLE 2
Continued



Pteronotus paraguayensis



Pteronotus paraguayensis

TABLE 5

Continued

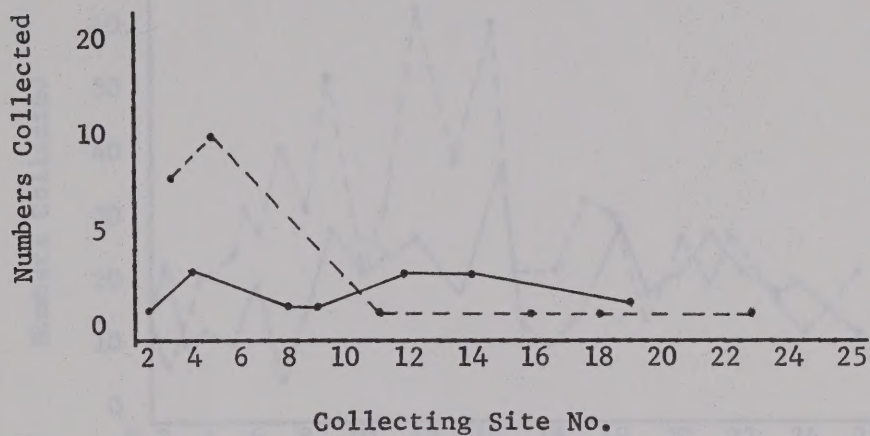
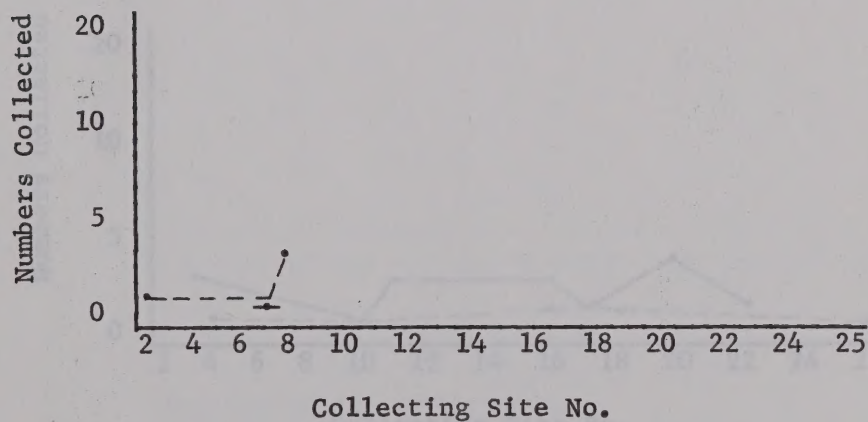
Dipodomys ordii uintensisPeromyscus crinitus auripectus

TABLE 2

Continued

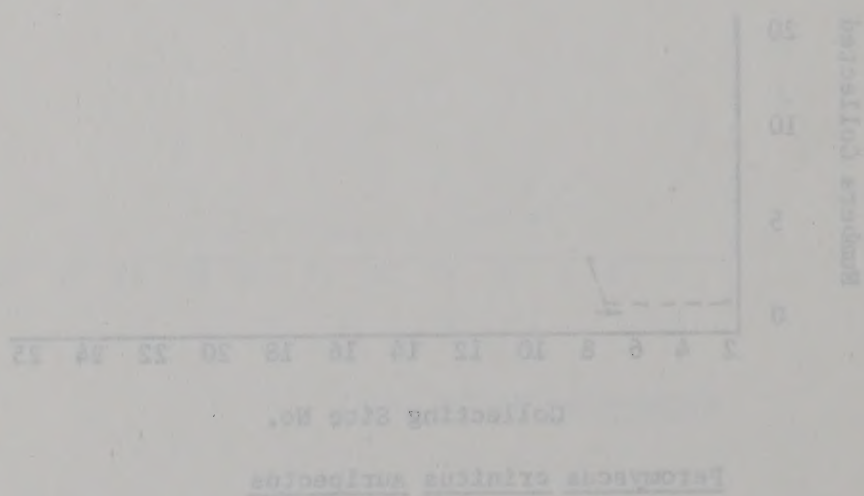
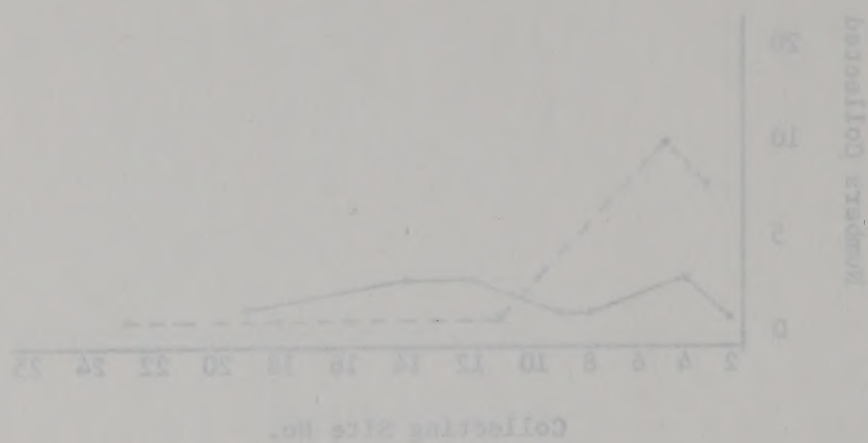
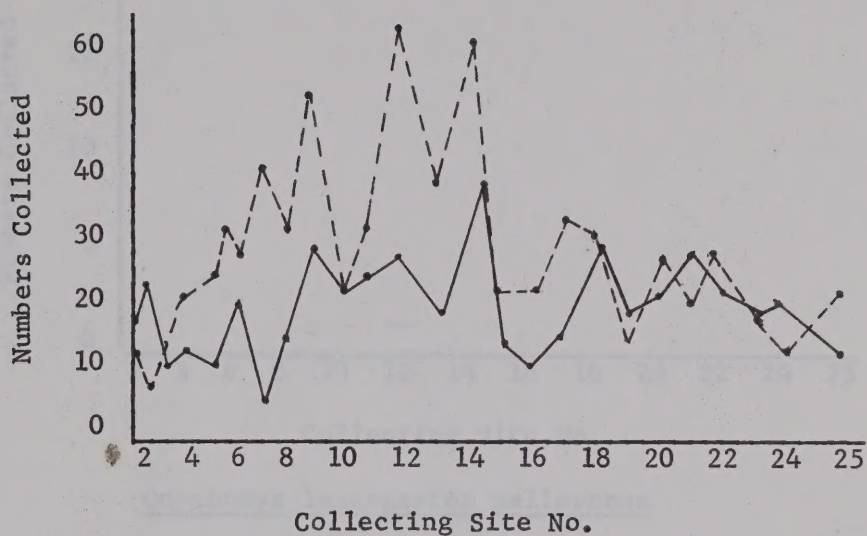
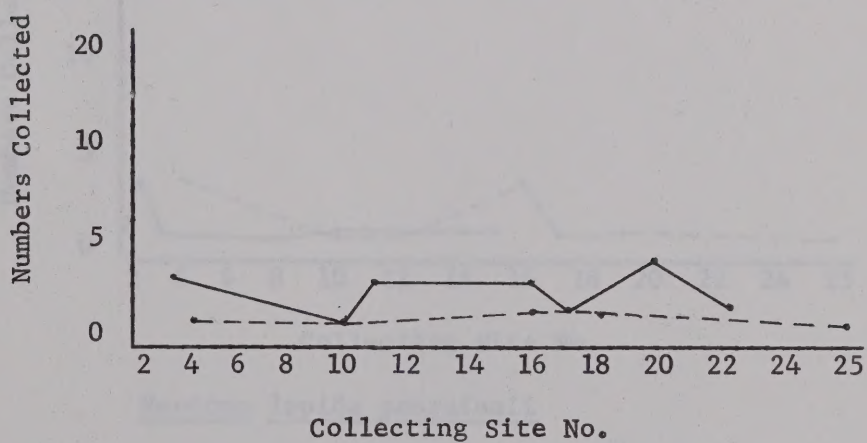


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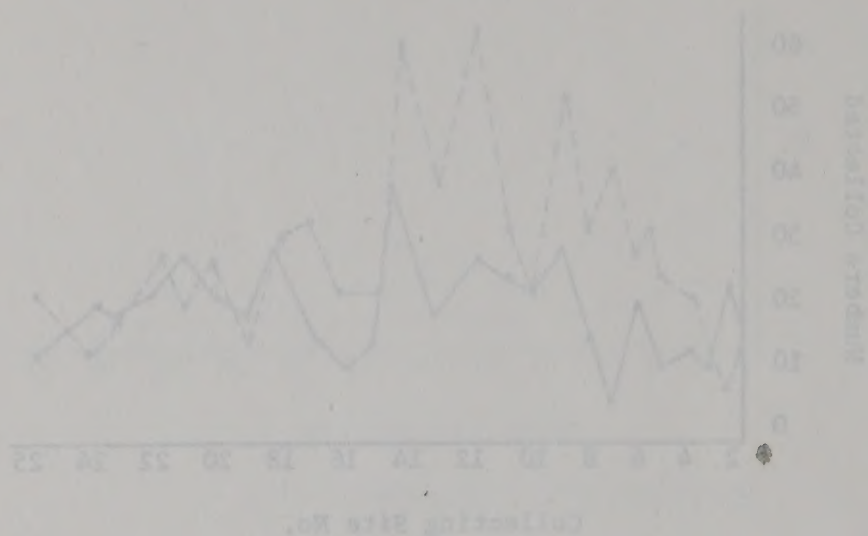


Peromyscus maniculatus nebrascensis



Peromyscus truei truei

TABLE 2
Continued

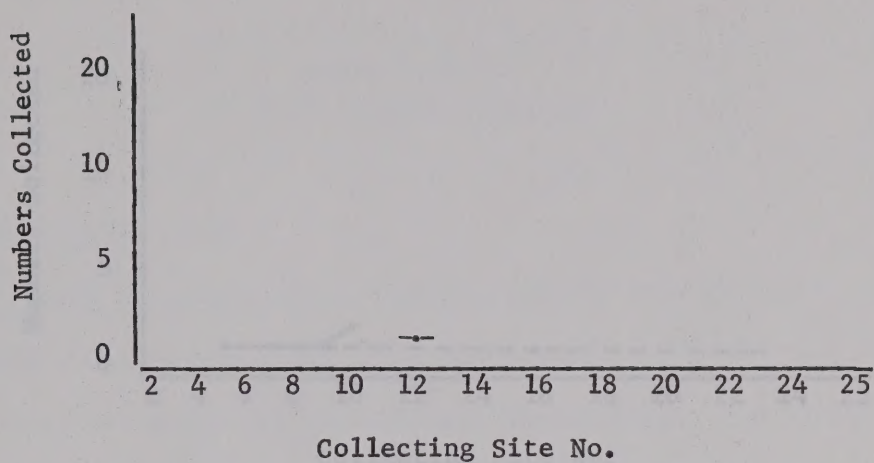


Peromyscus maniculatus leucogaster

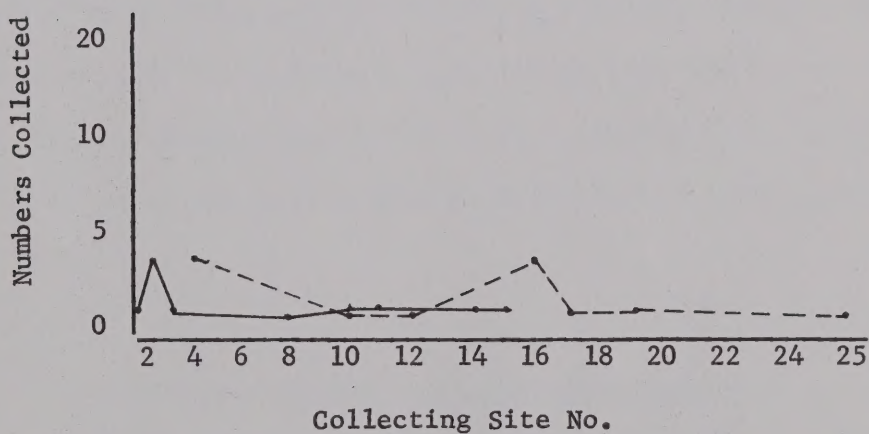


Peromyscus truei

TABLE 5
Continued



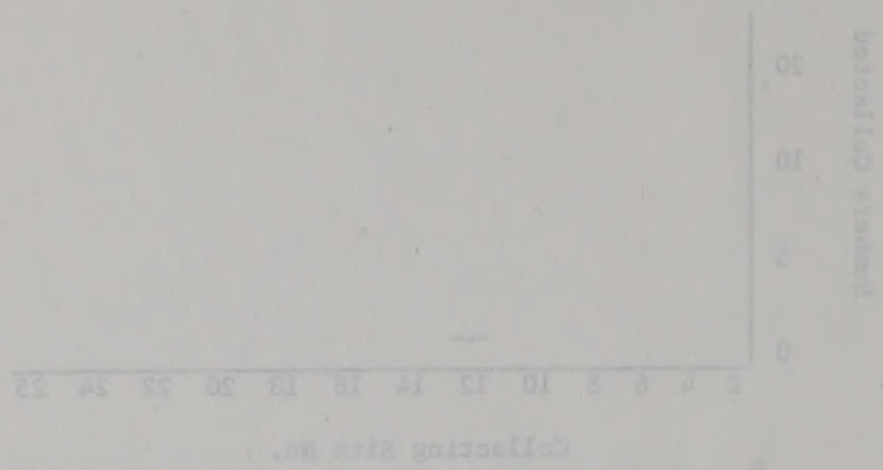
Onychomys leucogaster pallescens



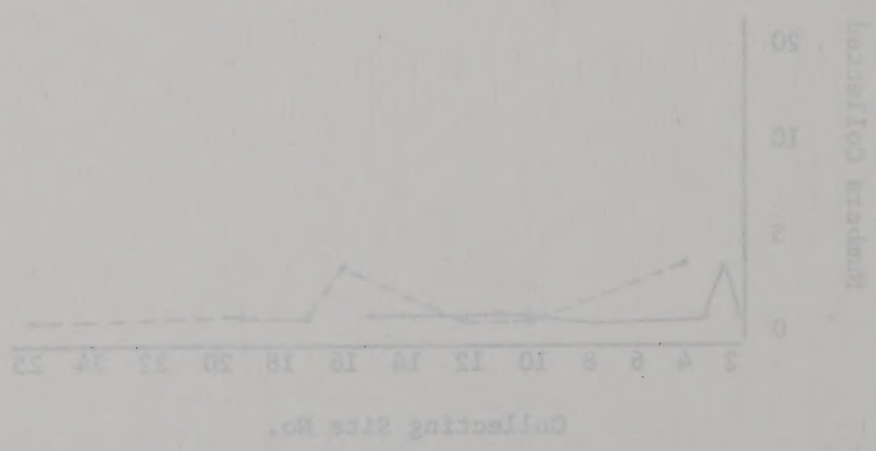
Neotoma lepida sanrafaeli

TABLE 2

Continued



Oxyechinus leucogaster pallidus



Neotoma lepida saxatilis

TABLE 5

Continued

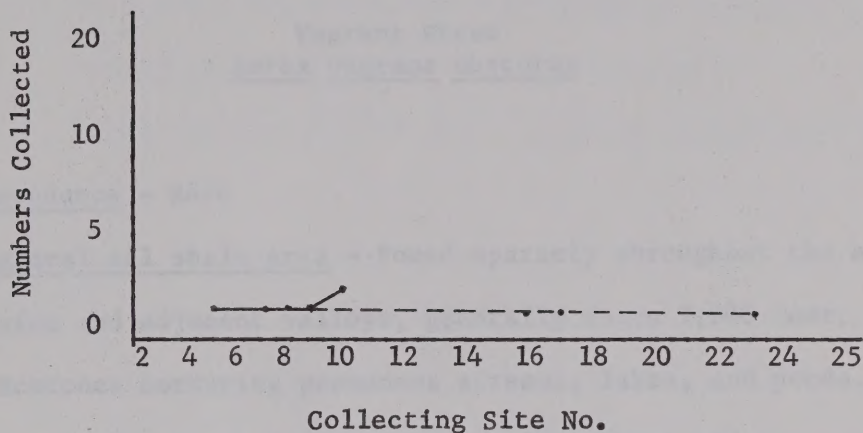
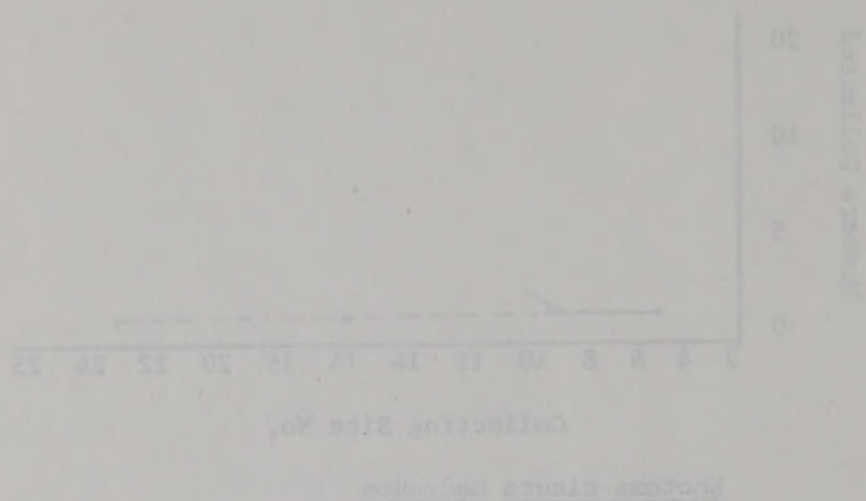
Neotoma cinera macrodon

TABLE 1
Continued



Species Accounts

Vagrant Shrew

Sorex vagrans obscurus

Relative abundance - Rare

Range in general oil shale area - Found sparsely throughout the area in high mountains and adjacent valleys, generally above 7,000 feet.

Habitat - Ecotones bordering permanent streams, lakes, and ponds.

Occurrence in White River study area (zone 2) - No records.

Extralimital records - Ranck (1961) collected two specimens near Hatch Cabin, South Canyon, north of P.R. Springs, 7,200 feet. Durrant (1952) examined specimens from Smith and Morehouse Canyon, 7,000 feet, Summit County; Mirror Lake, 10,000 feet, Duchesne County; junction of Deep and Carter Creeks, 7,900 feet, Daggett County; and Paradise Park, 10,000 feet, Uinta Mountains, and junction of Trout and Ashley Creeks, 9,700 feet, Uintah County.

Big Myotis - Myotis lucifugus carissimal

Yuma Myotis - Myotis yumanensis yumanensis

Long-eared Myotis - Myotis evotis evotis

California Myotis - Myotis californicus stephensi

Small-footed Myotis - Myotis subulatus melanorhimus

Species accounts

Variegated Snow
Saigona variata obscurus

Relative abundance - Rare

Range in general all shale areas - Found sparsely throughout the area in

high mountains and adjacent valleys, generally above 7,500 feet.

Habitat - Moisture bordering permanent streams, lakes, and ponds.

Distribution in White River study area (area 2) - No records.

Extensive records - Rank (1951) collected two specimens near Hatch, Utah.

South Canyon, north of U.S. Highway 7, 7,500 feet. Durrant (1952) examined

specimens from Hatch and Horseshoe Canyon, 7,000 feet. Summit County, Utah.

Lake, 10,000 feet, Duchesne County; junction of Bear and Carbon rivers.

7,500 feet, Big Lost Valley; and Pataquia Park, 10,000 feet, Uinta Mountains.

and junction of Trout and Ashley Creeks, 9,700 feet, Uinta County.

Big Hootie - Hootie hootie carolinensis

Small Hootie - Hootie hootie carolinensis

Long-eared Hootie - Hootie hootie carolinensis

California Hootie - Hootie hootie carolinensis

Small-footed Hootie - Hootie hootie carolinensis

Silver-haired Bat - Lasionycteris noctivigans

Western Pipistrelle - Pipistrellus hesperus hesperus

Big Brown Bat - Eptesicus fuscus pallidus

Townsend's Big-eared Bat - Corynorhinus townsendii pallescens

Pallid Bat - Anthrozous pallidus pallidus

Brazilian Free-tailed Bat - Tadarida brasiliensis mexicana

Relative abundance - Little study has been done with bats and the records of occurrence are substantiated by Ranck's observations and Durrant (1952). All of the above mentioned species have been either seen or collected in the oil shale study area. The big brown bat and the western pipistrelle are common in the area. Durrant (1952) indicates the Yuma myotis, California myotis, small-footed myotis, pallid bat and the Brazilian free-tailed bats, are probably near their northern limits of distribution, thus their occurrence would tend to be uncommon to rare.

Range in general oil shale area - Found throughout the area.

Habitat - Semi-arid desert frequenting areas with rocky outcrops, cliffs, and rock overhangs.

Occurrence in White River study area (zone 2) - Two pallid bats and one big brown bat were collected by Perry along Evacuation Creek five miles south of Ignatio Stage Stop. Confirmed records of occurrence were made by Ranck (1961) for all other species.

Extralimital records of occurrence - Durrant (1952:41) examined: a big myotis, Myotis lucifugus, collected at Willow Creek, Uintah County, 5,250 feet

Sliver-bellied Bat - *Lasiurus blythi*

Western Pipistrelle - *Pipistrellus hesperus*

Big Brown Bat - *Eptesicus fuscus*

Townsend's Big-eared Bat - *Myotis townsendi*

Pallid Bat - *Antrozous pallidus*

Mexican Free-tailed Bat - *Mus mus*

Endemic to Mexico - *Lasiurus blythi* - 122111 study has been done with bats and the results

of occurrence are substantiated by Jones's observations and Brown (1953).

All of the above mentioned species have been either seen or collected in the

all study areas. The big brown bat and the western pipistrelle are

common to the area. Brown (1953) indicates the same species, California

species, pallid-bellied species, pallid bat and the Mexican free-tailed bat.

are probably near their northern limits of distribution. The latter

species would tend to be common to the area.

Range in general all study areas - Found throughout the area.

Endemic - Endemic to Mexico - *Lasiurus blythi* - Found throughout the area, hills, and

rock outcrops.

Occurrence in White River study area (Area 2) - Two pallid bats and one big

brown bat were collected by Jerry King (University of Texas) in the area.

of Texas State Dept. Confirmed records of occurrence were made by

Jones (1953) for all other species.

Extensive records of occurrence - Brown (1953, 1954) examined: a big

species, *Myotis lucifugus*, collected at White River, Lincoln County, 2,100 feet

25 miles south of Ouray; a long-eared Myotis, Myotis evotis evotis, from Willow Creek, Uintah County, 5,250 feet, 25 miles south of Ouray; a long-eared bat, Corynorhinus townsendii pallescens, east side of confluence of the Green and White Rivers, one mile southeast of Ouray, 4,700 feet; pallid bat, Antrozous pallidus, Willow Creek, Uintah County, 5,250 feet, 25 miles south of Ouray; record obtained of Brazilian free-tailed bat, Tadarida brasiliensis mexicana, at Jensen, Uintah County (Hardy 1941:294).

White-tailed Jack Rabbit
Lepus townsendii townsendii

Relative abundance - Uncommon

Range in general oil shale area - Found throughout region concentrating in areas of permanent water.

Habitat - Brushy areas in close proximity to streams or ponds. Near farmlands, grassy foothills and mountains.

Occurrence in White River study area (zone 2) - Ranck states that he frequently observed white-tails in the vicinity of the Green and White Rivers. Three individuals were observed near Bitter Creek and the White River by Perry and Prouse, August 1974.

Extralimital records - Ranck found road-kills near Ouray at the Green and White Rivers. Durrant (1952:76) reports specimens from: 18 miles east of Mountain Home, Duchesne County; 17 miles northeast of Vernal, three miles southwest of Vernal, and 18 miles east of Vernal, Uintah County.

Black-tailed Jack Rabbit
Lepus californicus deserticola

Relative abundance - Uncommon - Rare

Range in general oil shale area - Throughout

Habitat - Desert shrub, pinyon-juniper, and open prairies.

Occurrence in White River study area (zone 2) - At peak years (1969, 1970)

the black-tail has been observed commonly by personnel of the D.W.R. and oil field workers (Olsen 1973:54). Prior to and after those years occurrence has been rare. Ranck (1961) and Olsen (1973) both state their abundance as rare. Perry and Prouse add three more observations, two from Hell Hole Canyon and one from Asphalt Wash.

Extralimital records - Olsen (1973:54) recorded two specimens, one, one mile south of Bonanza, and one, ten miles west of Bonanza.

Least Chipmunk - Eutamias minimus operarius

Colorado Chipmunk - Eutamias Quadrivittatus hopiensis

Relative abundance - Common

Range in general oil shale area - Throughout

Habitat - From dry semi-arid desert shrub to high elevation aspens and conifers. The Colorado chipmunk was found more commonly in the lower elevation xeric conditions while the least chipmunk was observed more frequently at higher elevation pinyon-junipers, south of the study area.

Black-tailed Jack Rabbit
Lepus californicus hesperophilus

Relative abundance - Common - Rare

Range in general alt. range - Throughout

Habitat - Desert shrub, piñon-juniper, and open grassland.

Comments in White River study area (June 2) - 41 peak years (1969, 1970)

The black-tail has been observed commonly by personnel of the U.S.N. and all field workers (Olson 1973:54). Prior to and after these years abundance has been rare. Ranch (1961) and Olson (1973) both state their abundance as rare. Berry and Brown add three more observations, two from Ball Lake.

Canyon and one from Apache Wash.

Extinct local records - Olson (1973:54) recorded two specimens, one, one white

south of Mesquite, and one, two miles west of Mesquite.

Least Chipmunk - *Eutamias minimus oregonus*

Colorado Chipmunk - *Eutamias flaviventris hesperophilus*

Relative abundance - Common

Range in general alt. range - Throughout

Habitat - From dry sand-silt desert shrub to high elevation aspen and

conifers. The Colorado chipmunk was found more commonly in the lower elevation with conditions while the least chipmunk was observed more frequently at higher elevation piñon-juniper, south of the study area.

Occurrence in White River study area (zone 2) - The Colorado chipmunk was the commoner of the two species in the oil shale area. Ranck and Olsen found both species inhabiting the region but the Colorado with a higher frequency in the lower regions of zone 2. Thirty-eight specimens of the Colorado chipmunk were collected by Perry in the area and only two least chipmunks from the same region (Table 2).

Extralimital records - Ranck found the least chipmunk commonly in the higher elevations of the East Tavaputs Plateau from pinyon-juniper to the conifers, 8,000 feet. Durrant (1952:144) records three specimens for E. quadrivittatus: east side of the confluence of the Green and White Rivers, one mile southeast of Ouray, 4,700 feet, Uintah County. For E. minimus he examined: three specimens, Brown's Corral, 20 miles south of Ouray, 6,250 feet; three specimens, P.R. Springs, 43 miles south of Ouray, Uintah-Grand County line, 7,950 feet; and from Howell (1929:48,51) the Uncompahgre Indian Reservation, Uintah County.

Yellow-bellied Marmot
Marmota flaviventris nosophora

Relative abundance - Uncommon

Range in general oil shale area - Throughout, in areas of rocky outcrops and talus slopes.

Habitat - Rocky slopes, outcrops, ledges, talus slopes, valleys and foothills up to 12,000 feet.

Occurrence in White River study area (zone 2) - Ranck reported individuals occurring along the rocky outcrops of Bitter Creek. No specimens were observed by Perry.

Extralimital records - Ranck found them frequently in the margins of Hill Creek and Willow Creek at the bases of steep, precipitous, sandstone cliffs. He also noted their close proximity to cultivated fields.

White-tailed Antelope Squirrel
Ammospermophilus leucurus pennipes

Relative abundance - Common

Range in general oil shale area - Throughout

Habitat - Desert shrub, low elevation pinyon-juniper generally occurring below 6,250 feet.

Occurrence in White River study area (zone 2) - Common throughout the desert shrub. Olsen (1973:55) found them to be more abundant in "areas of marked aridity". They were difficult to trap with the small museum special snap traps and their numbers are much higher than reflected in Table 2. Perry found them to occur abundantly in all areas of the oil shale region excepting the higher elevation pinyon-juniper south of the prototype area.

Extralimital records - Durrant (1952:124) examined specimens from Willow Creek, 29 miles south of Ouray, 5,400 feet, Uintah County and additional records from Howell (1938:176) from Vernal; junction of Green and White Rivers; Uncompahgre Indian Reservation; eight miles south of Ouray; 15 miles

Occurrence in White River study area (zone 2) - Black reported (individuals)

occurring along the rocky outcrop of Baker Creek. No specimens were

observed by Terry.

Extensive records - Black found them frequently in the margins of hills

and Willow Creek at the base of steep, precipitous, sandstone hills.

He also noted their close proximity to cultivated fields.

White-tailed Antelope Squirrel
Ammodontopsittacus leucurus pennsylvanicus

Relative abundance - Common

Range in general all study area - Throughout

Habitat - Desert shrub, low elevation piñon-juniper generally occurring

below 5,000 feet.

Occurrence in White River study area (zone 2) - Common throughout the desert

shrub. Olsen (1973:23) found them to be more abundant in "areas of wooded

shrubs". They were difficult to trap with the small mouse-trap used

there and their numbers are much higher than indicated in Table 2. Terry

found them to occur abundantly in all areas of the study region excepting

the highest elevation piñon-juniper south of the piñon-juniper area.

Extensive records - Burrows (1952:124) examined specimens from Willow

Creek, 15 miles south of Oury, 7,400 feet, Utah County and additional

records from Hamill (1938:136) from Vermont; junction of Green and White

Rivers; Hockmeyer Indian Reservation; eight miles south of Oury, 15 miles

southwest of Ouray, Uintah County.

Thirteen-lined Ground Squirrel
Spermophilus tridecemlineatus parvus

Relative abundance - Uncommon

Range in general oil shale area - Primarily confined to region west of the Green River but also found as far north as Diamond Mountain, Uintah County.

Habitat - Shortgrass prairies and sparsely scattered in mid-elevation desert shrub.

Occurrence in White River study area (zone 2) - No records.

Extralimital records - Ranck examined four specimens from Pariette Bench, 12 miles southwest of Ouray and west of the Green River. He suggested their presence north of the White River in the upper-sonoran habitat. Durrant (1952:117) examined three specimens from Red Creek, two miles north of Fruitland, 6,700 feet, Duchesne County; and Diamond Mountain, and Pariette Bench south of Ouray, Uintah County.

Rock Squirrel
Spermophilus variegatus utah

Relative abundance - Rare

Range in general oil shale area - Sparsely scattered primarily in agricultural

southwest of Oquirrh, Utah County.

Thirteen-lined Ground Squirrel
Spermophilus tridecemlineatus Say

Relative abundance - Occasional

Range in general oil shale area - Primarily confined to region west of the Green River but also found as far north as Diamond Mountain, Utah County. Habitat - Shrub-grass prairie and sparsely scattered in mid-elevation desert shrub.

Occurrence in White River study area (zone 2) - No records.

Examination records - Ranch examined four specimens from Tipton's Ranch, 11 miles southwest of Oquirrh and west of the Green River. He suggested their presence north of the White River in the upper-southern habitat. Oquirrh (1922:117) examined three specimens from Red Creek, two miles north of Tipton, 6,700 feet, Duchesne County; and Diamond Mountain, and Tipton's Ranch south of Oquirrh, Utah County.

Rock Squirrel
Spermophilus variegatus Merriam

Relative abundance - Rare

Range in general oil shale area - Sparsely scattered primarily in agricultural

and rocky areas.

Habitat - Rocky canyon, boulder strewn slopes, frequently near farms and agricultural areas.

Occurrence in White River study area (zone 2) - One individual was observed by Prouse near a bulldozed rock pile near Atchee Wash R23, ET11S, Sec. 23 NE $\frac{1}{4}$, on September 9, 1974.

Extralimital records - Ranck's only record for the area was an individual observed by Mrs. Jean Stevens of the Steven's Ranch on Willow Creek, Uintah County. Durrant does not include the rock squirrel in the region of Eastern Utah.

Golden-mantled Ground Squirrel
Spermophilus lateralis lateralis

Relative abundance - Common

Range in general oil shale area - Throughout

Habitat - Found in all habitats but more commonly in the upper elevation pinyon-juniper desert shrub.

Occurrence in White River study area (zone 2) - Ranck (1961) and Olsen (1973) concur that the golden-mantled ground squirrel is ubiquitous in distribution throughout the oil shale area. Our findings reveal the same although only two specimens were collected. This again reflects the inefficiency of the museum special traps in obtaining larger rodents.

and rocky areas.

Habitat - Rocky canyon, boulder stream slopes, frequently near farms and

agricultural areas.

Occurrence in White River study area (zone 2) - One individual was observed

by Brown near a bulldozed rock pile near Apache Wash R33, Ellis, Sec. 23

NE, on September 9, 1974.

Extant records - Ranch's only record for the area was an individual

observed by Mrs. Jean Stevens of the Stevens' Ranch on Willow Creek, Lincoln

County. Current data not include the rock aqueduct in the region of Eastern

Utah.

Golden-crowned Ground Squirrel
Spermophilus lateralis lateralis

Relative abundance - Common

Range in general all shale areas - Throughout

Habitat - Found in all habitats but more common in the upper elevation

pinon-juniper desert shrub.

Occurrence in White River study area (zone 2) - Ranch (1961) and Olsen (1973)

comment that the golden-crowned ground squirrel is ubiquitous in distribution

throughout the all shale area. Our findings reveal the same although only

two specimens were collected. This again reflects the insufficiency of the

current special traps in obtaining larger rodents.

Extralimital records - Six specimens, junction of Deep and Carter Creek, Daggett County; Paradise Park, Uinta Mountains, 10,000 feet; junction Trout Creek and Ashley Creek, 9,700 feet; Vernal; P.R. Springs, 7,950 feet; 43 miles south of Ouray; Uintah-Grand County line, Uintah County, Durrant (1952:130). Additional records were also recorded (Durrant 1952:130) for: Whiterocks; junction of Green and White Rivers, Uintah County; Mt. Delano; Petty Mountain, 15 miles north of Mountain Home; Carrant Creek, Uinta National Forest, Duchesne County.

White-tailed Prairie Dog
Cynomys leucurus

Relative abundance - Uncommon

Range in general oil shale area - Only active colonies located outside of zone 2.

Habitat - Mountain valleys between 5,200 and 8,400 feet; generally in open or slightly brushy country; also occasionally in pinyon-juniper.

Occurrence in White River study area (zone 2) - No records.

Extralimital records - Large colonies were observed by Olsen (1973:56) north of the White River in the open deserts. Perry also observed colonies there and southeast of Ouray 25 miles. Specimens recorded by Durrant (1952:107) were: One specimen, Duchesne, Duchesne County; Vernal; four miles west of Vernal; one and one half miles north of Tridell, 6,700 feet, Uintah County; Uncompahgre Indian Reservation, Uintah County.

Estimated records - Six specimens, junction of Deep and Carter Creek, Garrett County; Paradise Park, Blaine Mountain, 10,000 feet; junction Trout Creek and Ashby Creek, 9,700 feet; Vermont; P.E. Springs, 7,950 feet; 41 miles south of Carey; White-Grand Canyon line, Utah County, Durrant (1952:130). Additional records were also recorded (Durrant 1952:130) for: Whiteforks; junction of Green and White Rivers, Elmore County; Mt. Soliman; Petty Mountain, 15 miles north of Mountain Home; Orange Creek, White National Forest, Buchanan County.

White-Tailed Prairie Dog
Cynomys ludovicianus

Relative abundance - Uncommon
Range in general life history - Only active colonies located outside of zone 2.
Habitat - Mountain valleys between 5,500 and 8,400 feet; generally in open or slightly hilly country; also occasionally in piñon-juniper.
Occurrence in White River study area (zone 2) - No records.
Estimated records - Large colonies were observed by Olson (1973:26) north of the White River in the open desert. Petty also observed colonies there and southeast of Carey 15 miles. Specimens recorded by Durrant (1952:107) were: two specimens, Buchanan, Buchanan County; Vermont; four miles west of Vermont; one and one half miles north of Tridell, 6,700 feet, Utah County; Uncompahgre Indian Reservation, Utah County.

Northern Pocket Gopher
Thomomys talpoides ocus

Relative abundance - Uncommon

Range in general oil shale area - Occurs sporadically in areas of lowland shrubs where soil conditions favor burrowing.

Habitat - Xeric habitats between 5,600 feet and 7,500 feet. Found primarily in desert shrub and pinyon-juniper.

Occurrence in White River study area (zone 2) - Ranck obtained three specimens from the southern end of Asphalt Wash. One specimen was collected by Prouse in Asphalt Wash, about four miles east of Ranck's location.

Extralimital records - Ranck collected three specimens near Sand Wash, four miles northeast of Sunday School Canyon. Durrant (1952:170) lists specimens examined from: Vernal; Uncompahgre Indian Reservation; Brown's Corral, 20 miles south of Ouray, 6,250 feet; P.R. Springs, 43 miles south of Ouray, 7,950 feet, Uintah-Grand County line; Uintah County.

Olive-backed Pocket Mouse
Perognathus fasciatus callistus

Relative abundance - Uncommon

Range in general oil shale area - Restricted to semi-arid desert shrub lands.

Habitat - Grassy slopes, sandy soils and in pinyon-juniper.

Occurrence in White River study area (zone 2) - Olsen (1973:51) stated that this

pocket mouse is not found south of the White River. One specimen was collected by Prouse, however, in Southam Canyon, five miles southwest of Ignatio Stage Stop.

Extralimital records - Ranck (1961) indicated that their distribution was north of the White River. Olsen (1973:26) collected one specimen west of Bonanza 33 miles.

Apache Pocket Mouse
Perognathus apache caryi

Relative abundance - Common

Range in general oil shale area - Throughout

Habitat - Sagebrush; greasewood, shadscale, salt desert shrub and pinyon-juniper.

Occurrence in White River study area (zone 2) - Ranck collected five specimens within the area and Olsen (1973:26) obtained 11. Twenty-one individuals were obtained by Perry from all representative habitat types.

Extralimital records - Twenty-three specimens were obtained by Ranck (Olsen 1973:24). Durrant (1952:235) recorded: two specimens, Brown's Corral, 20 miles south of Ouray, 6,250 feet; and two specimens from Willow Creek, 25 miles south of Ouray, 5,250 feet, Uintah County.

Ord's Kangaroo Rat
Dipodomys ordii uintensis

Relative abundance - Common

Range in general oil shale area - Throughout in lower elevation xeric conditions.

Habitat - Desert shrub, predominantly in loose sandy soils at elevations below 6,500 feet. More common near Green and White Rivers.

Occurrence in White River study area (zone 2) - Ranck collected 17 specimens from the area (Olsen 1973:24), and Olsen 16 (Olsen 1973:26). Perry and Prouse obtained 21 individuals predominantly in desert shrub near the White River (Table 2).

Extralimital records - Ranck found them abundantly throughout the region and collected 77 specimens (Olsen 1973:24). The following were examined by Durrant (1952:261): (1), 15 miles west of Vernal; (1), four miles west of Vernal; (4), Vernal; (5), Jensen; (4), east side of Green River, three miles south of Jensen; (25), west side of Green River, three miles north of Ouray, 4,800 feet; (1), east side confluence of Green and White Rivers, one mile southeast of Ouray, 4,700 feet; (5), junction of Green and White Rivers, 4,800 feet, two miles south of Ouray; (8), Pariette Bench, 5,000 feet, eight miles south of Ouray; (4), Desert Springs, 10 miles south of Ouray; (2), Pariette Bench, 12 miles south of Ouray; (10), Brown's Corral, 20 miles south of Ouray, 6,250 feet, Uintah County. From Duchesne County: (4), Red Creek, 6,700 feet, two miles north of Fruitland; (1), 10 miles south of Myton; and (1), 20 miles south of Myton.

Western Harvest Mouse
Reithrodontomys megalotis megalotis

Relative abundance - Uncommon

Range in general oil shale area - Restricted to areas near water.

Habitat - Streamsides, with grassy banks. Occasionally found in desert shrub and pinyon-juniper.

Occurrence in White River study area (zone 2) - Eleven specimens were collected by Ranck (1961) while Olsen trapped only one (1973:26). No specimens were obtained by Perry.

Extralimital records - Ranck collected 29 individuals outside the zone 2 and Olsen four (Olsen 1973:24,26). From Uintah County, Durrant (1952:297) examined five specimens from Willow Creek, 25 miles south of Ouray, 5,250 feet.

Canyon Mouse
Peromyscus crinitus auripectus

Relative abundance - Uncommon

Range in general oil shale area - Restricted to localized areas.

Habitat - Rocky outcrops, ledges and talus.

Occurrence in White River study area (zone 2) - Ranck collected three individuals and Olsen one (Olsen 1973:24,26,57). Both observed their natural preference for rocky slopes and rock ledges. Perry collected five from similar habitats from Southam Canyon, and Asphalt Wash.

Extralimital records - A total of 15 animals were trapped by Ranck (1961).

Durrant (1952:304) reports from Goin (1944:191) a specimen from Hill Creek, 40 miles south of Ouray, 6,000 feet, Uintah County.

Deer Mouse

Peromyscus maniculatus nebrascensis

Relative abundance - Abundant

Range in general oil shale area - Ubiquitous distribution throughout all major habitat types.

Habitat - Desert shrub, greasewood-shadscale, pinyon-juniper, and salt desert scrub.

Occurrence in White River study area (zone 2) - The deer mouse is the most abundant mammal in the study area and represented 87 percent of the total small mammals collected by Olsen (1973:58). Perry collected 687 specimens representing 84 percent of the total mammals caught. Ranck similarly records them as the most abundant in the entire region occurring in all habitats and elevations.

Extralimital records - Durrant (1952:316) reports from Uintah County:

(9), Paradise Park, 45 miles northwest of Vernal, 10,500 feet; (1), Taylor Mountain, 16 miles northwest of Vernal; (5), junction Trout Creek and Ashley Creek, 9,700 feet; (1), Ashley Creek 10 miles northwest of Vernal; (3) four miles west of Vernal, 5,600 feet; (3), Powder Springs, 25 miles east of Vernal; (2), Powder Wash 15 miles southeast of Jensen; (27), east side con-

fluence of the Green and White Rivers, one mile southeast of Ouray, 4,700 feet; (26), Brown's Corral 20 miles south of Ouray, 6,250 feet; (14), Willow Creek, 25 miles south of Ouray, 5,250 feet; (5), Willow Creek, 29 miles south of Ouray, 5,400 feet; (36), P.R. Springs, 43 miles south of Ouray, Uintah-Grand County line, 7,950 feet. From Duchesne County: (5), Red Creek, two miles north of Fruitland, 6,700 feet.

Eighty-eight specimens were collected by Ranck from peripheral areas or 67 percent of the total P. maniculatus trapped.

Brush Mouse
Peromyscus boyliii rowleyi

Relative abundance - Rare

Range in general oil shale area - Restricted to isolated areas outside of zone 2.

Habitat - Brushy areas of the upper-sonoran, frequently found in ledgerrock.

Occurrence in White River study area (zone 2) - No records.

Extralimital records - Ranck collected one specimen in Willow Creek Canyon (Olsen 1973:58).

Pinyon Mouse
Peromyscus truei truei

Relative abundance - Common

Range in general oil shale area - Throughout

Habitat - Rocky terrain in pinyon-juniper forests; may also be found in desert shrub and salt desert scrub in oil shale area.

Occurrence in White River study area (zone 2) - Ranck obtained 11 specimens from the study area and Olsen, 18 (Olsen 1973:24,26). Six animals were trapped by Perry and Prouse, 1974.

Extralimital records - Nineteen specimens were trapped by Ranck for the outlying areas of the East Tavaputs Plateau. One animal was caught by Olsen on the perimeter of zone 2 (Olsen 1973:24,26). Durrant (1952:323) noted a record for Uintah County in Brown's Park (Osgood, 1909b:169).

Northern Grasshopper Mouse
Onychomys leucogaster pallescens

Relative abundance - Uncommon

Range in general oil shale area - Restricted to localized areas.

Habitat - Open country; grass, greasewood-shadscale, sagebrush; generally in sandy or gravelly soils.

Occurrence in White River study area (zone 2) - One specimen collected by Prouse near the head of Hell Hole Canyon.

Extralimital records - A total of four specimens were collected by Ranck for the East Tavaputs Plateau. It was obtained south of Ouray near the Green River. Olsen (1973:27) obtained five individuals north and west of Bonanza.

Desert Wood Rat
Neotoma lepida sanrafaeli

Relative abundance - Common

Range in general oil shale area - Common throughout entire region.

Habitat - Desert valleys, sagebrush, desert scrub; particularly rocky areas in pinyon-juniper.

Occurrence in White River study area (zone 2) - It is found commonly throughout the area although the numbers caught do not reflect their true abundance. Ranck trapped five specimens, Olsen 10, and Perry 11.

Extralimital records - Found commonly throughout region by both Ranck and Olsen (Olsen 1973:59).

Bushy-tailed Wood Rat
Neotoma cinerea macrodon

Relative abundance - Common

Range in general oil shale area - Throughout in most habitats.

Habitat - Low-elevation desert floors to high mountains; prefer rock slides, talus strewn slopes, and rocky overhangs.

Occurrence in White River study area (zone 2) - Again difficulty was encountered with the small museum special traps and the numbers are not indicative of their true abundance. Specimens have been collected by Ranck, Olsen and Perry. They have been found in all habitat types in the study

Desert Wood Rat
Neotoma lepida nuntialis

Relative abundance - Common

Range in general old shale area - Common throughout entire region.

Habitat - Desert valleys, sagebrush, desert scrub; particularly rocky areas

in piñon-juniper.

Occurrence in White River study area (zone 2) - It is found commonly throughout

the area although the numbers caught do not reflect their true abundance.

Ranch trapped five specimens, Olsen 10, and Perry 11.

Extraordinary records - Found commonly throughout region by both Ranch and

Olsen (Olsen 1973:29).

Bushy-tailed Wood Rat
Neotoma cinerea macroura

Relative abundance - Common

Range in general old shale area - Throughout in most habitats.

Habitat - Low-elevation desert floors to high mountains; prefer rock slides,

talus stream slopes, and rocky overhangs.

Occurrence in White River study area (zone 2) - Again difficult to see

counted with the small museum special traps and the numbers are not

indicative of their true abundance. Specimens have been collected by Ranch,

Olsen and Perry. They have been found in all habitat types in the study

area but are infrequently found in areas lacking at least an exposure of rocks or strewn boulders.

Extralimital records - Ranck collected eight specimens outside zone 2

(Olsen 1973:24). Durrant (1952:350) reports from Uintah County: (1), Moore's Ranch, Ashley Creek, five miles north of Vernal; (2), Vernal; Uncompahgre Indian Reservation. Duchesne County: (1), Myton. Daggett County: (4), junction of Deep and Carter Creeks, 8,000 feet; Hideout; Beaver Creek; Granite Park.

area but are independently found in mass basking at least an exposure of

rocks or stream boulders.

Extirpated records - Ranch collected eight specimens between 1915 and 1925

(Olan 1915:25). Between (1925:25) reports from United County: (1),

Moore's Ranch, Ashlar Creek, five miles north of Tipton; (2), various;

Thompson's Indian Reservation, Indian County: (1), Tipton. Between

County: (a), Junction of Deep and Carter Creeks, 8,000 feet; (b),

Beaver Creek; Granite Park.

Population Densities and Habitat Preferences

Species and numbers of individuals obtained during the study were analyzed per vegetative type (Table 6) and assigned a percentage as to their frequency of occurrence in each area. Table 6 gives the numbers collected in each area but as was discussed by Olsen (1973:62) these figures may be misleading as each vegetative type was not sampled the same number of times. More accurately the percentage figures, constitute a more precise analysis of habitat preferences.

Olsen (1973:62-89) details the inaccuracies and conclusions obtained through the use of the small snap traps in determining population densities and it should be kept in mind this study "monitors" Olsen's findings and does not attempt to reconstruct density numbers or methods into another format.

Perry found deer mice, as did Olsen, the most abundant and ubiquitous rodent in the oil shale area. Percentages ranged from 58 percent in the salt desert shrub to 99 percent in the cottonwood-willow-tamarix with an overall average of 84 percent of the total mammals collected. Olsen similarly reflects ranges from 79.9 to 100 percent with an average of 88.6 percent.

In the pinyon-juniper belt deer mice comprised 82 percent of the total mammals obtained, the Colorado chipmunk eight percent, and Ord's kangaroo rat four percent. Nine species were captured from this area. Olsen (1973: 63) obtained seven species from that habitat and adds to the list with the least chipmunk.

TABLE 6

Numbers and Percentages of Occurrence of Small Mammals Collected in Each Vegetative Type of the Utah Oil Shale Area - 1974-1975

SPECIES	HABITAT	Desert Shrub	Salt Desert Shrub	Sagebrush	Greasewood	Pinyon-Juniper	Cottonwood-Willow-Tamarix	Total	% of Total
<i>Eutamias minimus</i>				(1) 1			(1) .5	2	.2
<i>Eutamias quadrivittatus</i>			(4) 5	(9) 3	(5) 6	(22) 8		40	.5
<i>Ammospermophilus leucurus</i>	(1) 3	(4) 5	(4) 1					9	1
<i>Spermophilus variegatus</i>			(1) .4					1	.1
<i>Spermophilus lateralis</i>				(1) 1	(2) .7			3	.4
<i>Thomomys talpoides</i>							(1) .5	1	.1
<i>Perognathus apache</i>		(10) 13	(5) 2	(3) 3	(3) 1			21	2.5
<i>Perognathus fasciatus</i>					(1) .3			1	.1
<i>Dipodomys ordii</i>	(1) 3	(8) 11	(1) .4	(1) 1	(11) 4			22	2.7
<i>Peromyscus crinitus</i>			(4) 1	(1) .1				5	.6
<i>Peromyscus maniculatus</i>	(30) 91	(44) 58	(25) 91	(73) 83	(22) 82	(72) 99		698	84
<i>Peromyscus truei</i>		(1) 1		(3) 3	(3) 1			7	.8
<i>Onychomys leucogaster</i>	(1) 3							1	.1
<i>Neotoma lepida</i>		(5) 7	(1) .4	(1) 1	(5) 2			12	1.4
<i>Neotoma cinerea</i>			(2) .7		(2) .7			4	.5
Total Number Obtained		33	76	284	89	271	74	827	100%
Percent of Gross Trap-Nights		4	8	32	16	28	12		

*Numbers below figures in parentheses indicate percentages of total individuals obtained per vegetative type.

Deer mice contributed 91 percent to mammals of the desert shrub, the white-tailed antelope squirrel three percent, Ord's kangaroo rat three percent, and the northern grasshopper mouse three percent. Olsen obtained specimens of the olive-backed pocket mouse and western harvest mouse from the same area but had 20 percent trap nights in the area as compared to four percent by Perry.

The salt desert shrub had the lowest proportional number of deer mice (58 percent) than the other types. Olsen, however, captured 46 or 80.7 percent. The fact that two more species were caught, each represented by several specimens, would account for the lower percentage, taking into account all other factors equal with Olsen's data. Thirteen percent of the total collected by Perry were Apache pocket mice and seven percent desert wood rats.

Nine species were obtained in the sagebrush community. Eight of the species each contributed less than three percent. Deer mice comprised 91 percent of the total captured.

The greasewood yielded nine kinds. The Colorado chipmunk was captured six percent of the time, Apache pocket mouse three percent, and pinyon mouse three percent. Deer mice made up 83 percent and all others one percent. Olsen obtained five species from the greasewood, but lacking the least chipmunk, Colorado chipmunk, canyon mouse, and pinyon mouse collected by Perry and Prouse. One explanation for the difference might be a closer proximity of collecting sites to the pinyon-juniper as the above listed species are more indigenous to that habitat.

The cottonwood-willow-tamarix received 12 percent of the total percent

of gross trap nights while Olsen sampled the area two percent of the total. Perry adds to his list with the northern pocket gopher, and the least chipmunk. Each, however, comprised only .5 percent of the total density.

Threatened and Endangered Species

Only two species, the black-footed ferret, Mustela nigripes, and the spotted bat, Euderma maculatum, have probable occurrence in the oil shale area. Olsen (1973: 40-41) summarizes field observations of ferrets from Northeastern Utah. Five sightings were made from 1966 to 1970 at Moore, Emery County, 90 miles from the oil shale area, two from Green River, Utah, 60 miles distant, one from Price, Utah 60 miles southwest of the region, and 10 miles northeast of Vernal at Brush Creek. Their occurrence is related directly with the association of white-tailed prairie dog, Cynomys leucurus. In zone 2 of the oil shale area the white-tailed prairie dog is rare but is found commonly in "towns" north of the White River and an area west of Bitter Creek between Cottonwood Wash and Sand Wash.

Durrant (1952) includes the spotted bat in his report on "Mammals of Utah" and substantiates it with records from Salt Lake County, and San Juan County. The U.S. Department of the Interior (1973) records its presence in Bryce Canyon area, Utah. Little information is available on this species and further studies would be necessary to determine its probable occurrence in the oil shale area.

Harvest and Trapping of Carnivores and Furbearers

The list of carnivores and furbearers of the oil shale area are: Beaver, castor canadensis duchesnei, Muskrat, Ondatra zibethicus osoyoosensis, Coyote, Canis latrans lestes, Gray Fox, Urocyon anereoargenteus scottii, Black Bear, Ursus americanus annamomuna, Ringtail cat, Bassariscus astutus arizonensis, Raccoon, Procyon lotor, Badger, Taxidea taxus taxus, Spotted Skunk, Spilogale putorius gracilis, Striped Skunk, Mephitis mephitis estor, Mountain Lion, Felis concolor hippolestes, and Bobcat, Lynx rufus pallescens.

All of the **species** listed have been documented by personnel from the Division of Wildlife Resources, Ranck (1961) and Olsen (1973) but quantitative information in regard to harvesting is only available for the Coyote, Mountain Lion, and Bobcat. Olsen (1973) dates through 1972 the numbers of species obtained in the general region but does not define specific areas within the oil shale area. Similarly quantitative information in specific areas of zone 2 was unobtainable through Division of Wildlife Resources and further investigation will be necessary to monitor the trapping and harvesting of carivores and furbearers in that region of the oil shale area.

Impact and Recommendations

The impact of the oil shale development is somewhat difficult to assess at the present time because of the various plans that have been presented both for development of the region and the mining process. A city, near Southam Canyon, of 5,000 to 10,000 people has been proposed and would present the greatest impact upon the flora and fauna of the region. Though secondary, people would affect the resident mammal populations the greatest by poisoning, shooting, trapping, or providing suitable habitat for more cosmopolitan species (often considered "pest" species) such as the house mouse, Norway rat, pocket gopher, meadow mice (Microtus), striped skunk, and porcupine. Generally the larger species, i. e. badger, coyote, fox, ringtail cat, bobcat, mountain lion, and bear, will become targets of hunters and shooters and their numbers will decline considerably. The small nongame mammals will probably receive slight disturbance because of their size, nocturnal habits, and greater abundance.

Literature Cited

- Durrant, S.D. 1952. Mammals of Utah, taxonomy and distribution. Univ. Kansas Publ., Museum Natural History, 6:1-549.
- Durrant, S.D., M.R. Lee and R.M. Hansen, 1955. Additional records and extensions of known ranges of mammals from Utah. Univ. Kansas Publ., Museum Natural History, 9:69-80.
- Fletcher, K. and M.F. Baldwin. 1973. A scientific and policy review of the prototype oil shale leasing program final environmental impact statement of the U.S. Department of the Interior. Prepared by the Environmental Impact Assessment Project of the Institute of Ecology, Washington, D.C., October 29, 1973; 197p.
- Hall, E.R. and K.R. Kelson. 1959 The Mammals of North America. Vol I, II. Ronald Press, New York, 1,083p.
- Hansen, R.M. 1954. Ground squirrels (Citellus) of Utah, Unpubl. Ph.D. dissertation, Univ. Utah, 197p.
- Kelson, K.R. 1951. Speciation is rodents of the Colorado River drainage of eastern Utah. Univ. of Utah Biol. Series, 11:1-125.
- Kelson, K.R. 1949. Two new woodrats from eastern Utah. J. Wash. Acad. Sci. 39:417-418.
- Olsen, P.F. 1973 Wildlife resources of the Utah oil shale area. Pub. No. 74-2 Utah State Division of Wildlife Resources, December 1973, 1-147.
- Ranck, G.L. 1961. Mammals of the East Tavaputs Plateau. Unpubl. M.S. thesis, Univ. Utah, 229p.

Literature Cited

Bartlett, S.D. 1954. Mammals of Utah, taxonomy and distribution. Utah
Natura Publ., Museum Natural History, 8:1-248.

Bartlett, S.D., R.E. Lee and S.H. Newman. 1955. Additional records and
extension of known ranges of mammals from Utah. Utah Natura Publ.,
Museum Natural History, 9:69-80.

Fletcher, R. and M.P. Caldwell. 1953. A scientific and policy review of the
proposed new state land-use program final environmental impact statement
of the U.S. Department of the Interior. Prepared by the Environmental
Impact Assessment Project of the Institute of Ecology, Washington,
D.C., October 29, 1953, 195p.

Hall, E.R. and K.E. Nelson. 1955. The mammals of North America, Vol. I, II.
Ronald Press, New York, 1,002p.

Hansen, E.M. 1954. Cynomys (Rodentia) of Utah. Mammals, 20:8.
dissemination, Univ. Utah, 1954.

Kelson, K.E. 1951. Distribution of rodents of the Colorado River drainage
of eastern Utah. Univ. of Utah Publ. Zool., 15:1-115.

Kelson, K.E. 1952. Two new rodents from eastern Utah. J. Wash. Acad.
Sci. 50:411-415.

Olson, E.Z. 1953. Wildlife resources of the Utah and Idaho area. Pub.
No. 70-1 Utah State Division of Wildlife Resources, December 1953,
1-167.

Rausch, O.L. 1951. Mammals of the East Tennessee Plateau. Univ. N.Y.
Publ., 1951, 195p.